SA Work Plan
Final Phase I

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PHASE II
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN
BUTLER MINE TUNNEL SITE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
DOCKET NO. III - 87 - II - DC

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FOR: RESPONDENTS

DATE : MAY 5, 1989 (SECOND REVISION)

INTRODUCTION

Under date of March 30, 1987 the Federal Environmental Protection Agency -Region III (EPA) and certain Potentially Responsible Parties (Respondents) entered into an "Administrative Order by Consent" (Consent Order), U.S. EPA Docket No. III-87-II-DC. The Phase I Remedial Investigation (Phase I RI) report identified in Section VI of the Consent Order was transmitted by the Respondents to EPA under date of August 17, 1987. EPA review comments were forwarded to the Respondents under date of October 15, 1987. The response of the Respondents to EPA's Phase I RI report comments was made under date of December 15, 1987.

Also under date of December 15, 1987 Respondents submitted to EPA a Work Plan for additional work necessary to complete the Remedial Investigation ("Phase II RI"), and for the Feasibility Study ("FS"). The Work Plan submittal was made in compliance with the requirements set forth in "Section IX. WORK TO BE PERFORMED, 6." of the Consent Order. EPA review comments were received under dates of January 15 and 21, 1988; and on February 5, 1988 Respondents met with EPA in Philadelphia to review and discuss the comments. A revised Work Plan document was prepared in response to EPA concerns expressed, and the agreements made, at the Philadelphia meeting. One such agreement pertained to EPA review comments addressing the discussion or inclusion of certain information and data in the "RI report". It was agreed that those particular comments were made by EPA in the context of the Phase II RI report, and submittal of the revised Work Plan dated April 5, 1988 was based on said agreement.

At or around the time of the submittal of the revised Work Plan, EPA was made aware by DER of a mine subsidence control flushing project being proposed by DER for an area underlying Dupont Borough. EPA in turn made Respondents aware of the proposed flushing project. Said project is within the limits of the Heidelberg Colliery, which is contiguous to the Butler Colliery. Since mine mapping indicates that the barrier pillar between the two collieries is breached, both EPA and Respondents expressed concern over the possible impact that the flushing project might have on Butler Colliery ambient conditions. The EPA Project Coordinator advised Respondents under date of June 29, 1988 that implementation of the revised Work Plan would be held in abeyance until such time as EPA had resolved its concerns with DER. During the course of discussions between EPA and DER, an agreement was reached between the two

agencies to undertake certain monitoring, sampling and analytical work to establish ambient conditions in the Heidelberg and Butler Colliery mine pools, and the Tunnel discharge. It was further agreed that at such time as the flushing project commenced, additional monitoring, sampling and analytical work would be undertaken to assess the extent of its impact on the previously established ambient conditions.

Subsequent to the installation of certain exploratory boreholes by DER, EPA commenced monitoring, sampling and analysis efforts in early October, 1988. This work was terminated in late October, 1988, when EPA was advised by DER that the flushing project had been temporarily deferred. At the same time as EPA was conducting its monitoring, sampling and analytical work, Respondents were undertaking complementary sampling and analysis. On March 7, 1989 EPA advised Respondents that since DER had not proceeded with the flushing project, and furthermore had no schedule for its start, Respondents were to undertake necessary revisions to the Work Plan in order to take into account changed conditions.

Respondents and EPA subsequently met on March 23, 1989 to review and discuss the information and data gathered during the October, 1988 monitoring, sampling and analytical efforts, and the extent to which this information and these data might affect the revised Work Plan of April 5, 1988. Respondents advised EPA by letter dated April 6, 1989 of proposed changes to the revised Work Plan, and EPA approved such changes by letter dated April 10, 1989. The preparation of this second revision to the Work Plan has been based on these two April letters.

This Work Plan is comprised of two major components; namely, the Phase II Remedial Investigation and the Feasibility Study. It has been prepared on the basis of the "Model Statement Of Work" for conducting remedial investigations and feasibility studies as set forth in the EPA publications titled, "Guidance on Remedial Investigations Under CERCLA" and "Guidance on Feasibility Studies Under CERCLA". The Work Plan proposes phase II RI studies and investigations to gather additional information and data pertaining to the nature and extent of the problem. The Plan further proposes the completion of certain Feasibility Study tasks concurrently with the Phase II RI. Although Respondents are prepared to undertake the balance of the Feasibility Study set

forth in the Work Plan, the extent of such effort will be documented upon completion of the Phase II RI and the initially proposed Feasibility Study tasks. At that time, the schedule for completion of the Feasibility Study will also be prepared.

When information and data presented in the Phase I RI report have been relied upon in the preparation of this Work Plan, the applicable Phase I RI section has been referenced.

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PHASE II REMEDIAL INVESTIGATION

TASK I - DESCRIPTION OF CURRENT SITUATION

1.0 Site Background

Regional location considerations; pertinent political and environmental boundary features; general area physiographic, hydrologic and geologic features; and the general nature of the problem have been presented in the Phase I RI report. It is felt at this time that "Site Background" requirements are adequately addressed.

1.1 Nature And Extent Of Problem

Available information and data pertaining to a) the types, physical states and amounts of hazardous substances, as well as b) public health and environmental concerns have been presented in the Phase I RI report. Since further effort is being proposed as part of the Phase II RI to better define the nature and extent of the problem, the information and data presented in the Phase I RI report are summarized in the balance of this Section.

1.1.1. Types And Physical States Of Hazardous Substances

During a time period generally identified as running from mid-1978 through July 1979, industrial wastes, possibly contaminated with various hazardous substances, were discharged through the HWAS borehole into the mine workings drained by the Tunnel. The precise composition of the wastes was never established by EPA or DER; but the basic components were apparently waste oil or petroleum products, and industrial wastewaters or sludges containing water-soluble compounds. These wastes originated from various industrial sites located in the Northeast.

In 1979 the Commonwealth of Pennsylvania prepared a listing of compounds and chemicals alleged to have been discharged into the HWAS borehole (Phase I RI; Section 3.3.1). This listing identified various classes of petroleum wastes that may have been contaminated with hazardous and/or non-hazardous chemicals, non-hazardous organic substances, non-descript trade name

compounds, and inorganic elements and compounds. A goodly number of these materials, in addition to being identified by DER as having been discharged into the HWAS borehole, could also originate from a multiplicity of other sources.

During the course of both the 1979 and 1985 discharge incidents, EPA and DER established the presence of oil and cyanide; and the presence or possible presence of various other organic and inorganic pollutants by chemical analyses of the water and oil phases of Tunnel discharges and mine pools. Those pollutants identified in the Consent Order are listed in Table 1-1.

TABLE 1-1

Pollutants Identified In Consent Order

Benzene	Dimethyl Phthalate
Bis(2-EH)phthalate	Di-n-Octyl Phthalate
4-Bromophenyl Phenyl Ether	Ethylbenzene
Carbon Tetrachloride	Methylene Chloride
Chloroform	Napthalene
Cyanide	Phenol
Dichlorobenzene	Toluene
Diethyl Phthalate	Trichloroethylene
	Xylene

1.1.2 Hazardous Substances Quantities

At the time of the 1979 discharge incident EPA and DER estimated that 2 million gallons of oil and wastewater had been discharged to the HWAS borehole by the hauler, and that the composition of the mixture was 50 percent oil and 50 percent wastewater. There is apparently no documentation for these estimates (Phase I RI; Section 3.4.1).

Subsequent efforts were expended by the Respondents to collect volume-related information and data. These efforts indicate that all wastes discharged into the borehole were apparently administered through the hauler's Syracuse, New York and Edgewater, New Jersey handling terminals. According to deposition testimony from the manager of the Syracuse terminal and Syracuse terminal transport records, wastes hauled from the terminal and discharged into the borehole totaled approximately 435,000 gallons (Phase I RI; Section 3.4.1).

Only portions of the Edgewater terminal shipping records are available for the relevant period, and these records are such that several estimates of HWAS borehole discharge volume can reasonably be calculated. These estimates range from approximately 1,180,000 to 2,520,000 gallons, with the most probable volume currently estimated at 1,740,000 gallons. Therefore, updated estimates of the total volume discharged into the HWAS borehole in 1978/1979 range from approximately 1,617,000 to 2,955,000 gallons, with the most probable volume currently estimated at 2,175,000 gallons (Phase I RI; Section 3.4.1).

It is also known that the hauler during the relevant period was conducting two essentially different operations; namely, oil recycling for subsequent sale, and wastewater disposal. Although oil was recovered at the Syracuse and Edgewater terminals, the actual quantity is currently unknown. According to the deposition testimony of the Syracuse manager only three incoming loads were not treated for oil recovery during the relevant period. Although he stated that in his estimation the average oil content of all wastes received during the relevant period was about 30 percent, there is currently no information or data pertaining to the oil content of wastewaters sent from the terminal to the HWAS borehole. However, since re-refining did take place it is reasonable to assume that the oil content of shipments to the borehole was less than the "as-received" content.

While Edgewater terminal records suggest a high variability in oil content in loads shipped to the HWAS borehole, some Respondents' records indicate that many loads collected by the hauler were wastewaters with a low oil content. This finding of low oil content is consistent with the Edgewater

dispatcher's statement that mixed loads of oil and wastewater received at the terminal were re-refined if the oil content was sufficiently high. The records of other potentially responsible parties remain to be reviewed. The dispatcher has further stated that some loads with a treatable oil content apparently were diverted directly to the borehole. For example, some Edgewater records indicate that on occasion treatable oil loads from other hauler terminals (e.g., Springfield, Virginia) were sent directly to the borehole.

Apparently, quantitative data pertaining to the constituents in aqueous phase discharges into the HWAS borehole do not exist. Certain qualitative information, and some data, are available in the form of CERCLA Section 104(e) responses from various potentially responsible parties. Such information and data though are applicable to loads hauled from an industrial site; not to wastes discharged into the HWAS borehole.

1.1.3 Public Health And Environmental Concerns

The public health and environmental exposure routes of potential concern identified by DER and EPA during the course of the 1979 and 1985 discharge incidents were a) Susquehanna River water and sediments, b) Susquehanna River and general area biota and, c) air. The results of DER and EPA exposure route studies and investigations are set forth in the balance of this Section.

Susquehanna River Water

On-going River water quality studies undertaken by DER and others have not identified Tunnel discharges during the course of the 1979 and 1985 discharge incidents as having had any long-term measurable impact on water quality. These studies have for the most part concerned themselves with biological and inorganic parameters, not organic parameters (Phase I RI; Section 5.4).

The most consistently monitored organic compound found in the Tunnel discharge during the 1979 discharge incident was dichlorobenzene, this

constituent being used to detect the presence of the Tunnel discharge in the River. During the initial stage of the 1979 discharge incident, maximum dichlorobenzene concentrations in River water samples were measured at 16 ppb 3 miles downstream of the Tunnel, and 0.43 ppb 60 miles downstream of the Tunnel at the intake to the Danville water works. These concentrations were well below the recommended maximum drinking water contaminant levels of 620 ppb for ortho-dichlorobenzene and 75 ppb for para-dichlorobenzene (Phase I RI; Section 5.5)

Tunnel discharge toxicity data developed in August 1980 by EPA showed that the discharge was slightly toxic to fathead minnows and moderately toxic to the macroinvertebrate species Daphnia Pulex. Test results though could not be attributed to particular characteristics of the Tunnel discharge by EPA, and the study concluded that adverse effects would be limited to the immediate area of the outfall because of River dilution (Phase I RI; Section 9.4).

The impact of Tunnel discharges on River water quality during the 1985 discharge incident was assessed by EPA in October 1985. Samples collected at that time were subjected to gas chromatography/mass spectrometry analyses. These analyses did not detect any of the compounds found in the Tunnel discharge (Phase I RI; Section 5.5).

Susquehanna River Sediments

Sediment samples collected in August 1979 by DER in the immediate vicinity of the Tunnel outlet had dichlorobenzene concentrations somewhat in excess of River water sample concentrations but still well below the water quality criteria for chronic effects; while dichlorobenzene was not detected in samples collected approximately 30 miles downstream of the Tunnel. August 1979 sediment samples collected for cyanide analysis had concentrations in excess of the EPA threshold level, but these concentrations decreased substantially within relatively short distances from the Tunnel outlet. Samples collected in the middle of 1980 by DER in the vicinity of the Tunnel mouth contained metal concentrations comparable to concentrations found in upstream sediment samples (Phase I RI; Section 5.6.2).

Biota

The results of on-going biological monitoring in the Susquehanna River do not attribute any adverse aquatic or terrestrial biota conditions to Tunnel discharges. Overall biological (fish and aquatic macroinvertebrate) monitoring results have complemented water quality results (Phase I RI; Section 7.1).

Fish collected in the vicinity of the Tunnel outlet at the beginning of August 1979 by DER did not indicate an abnormal population distribution. Differences in diversity relative to Tunnel location were attributed more to habitat differences and entrance of the Lackawanna River than to effects from Tunnel discharges. Also in August 1979, flesh analyses were conducted by the U.S. Food and Drug Administration on fish collected within the River with only dichlorobenzene and aroclor being detected. According to DER, test results indicated that dichlorobenzene was not accumulating in the fish; and furthermore, the report stated that measured concentrations could have been due to sample contamination. The report made no comment on the aroclor (PCB) concentrations possibly because PCB had not been identified as a constituent of concern in Tunnel discharges (Phase I RI; Section 7.1.1.). Available River sediment analyses also indicate the presence of PCB contamination upstream from the Tunnel.

No unique shoreline habitat is identified by regulatory agencies as existing anywhere along the Susquehanna River for a distance of 70 miles below the Tunnel, and there are no protected species that regularly inhabit the Butler Colliery vicinity (Phase I RI; Sections 7.2 and 7.3). No endangered or threatened species, or their habitats, are identified in available information as having been adversely affected as the result of either Tunnel discharge incident. The U.S. Department of the Interior has stated that although no natural resources were or are currently affected by Tunnel discharges, a low level potential for adverse impact continues to exist (Phase I RI; Section 2.3).

Ambient Air

Extensive domestic borehole sampling for hydrogen cyanide gas undertaken by EPA and DER during the 1979 discharge incident gave no indication of any adverse public health impact. Utilizing data from the exploratory borehole sampling effort, dispersion air modeling was also undertaken by EPA. On the basis of this modeling, EPA determined that the potential for adverse public health impact in the outdoor environment was insignificant (Phase I RI; Section 6.3).

Extensive ambient air monitoring for various organic compounds was undertaken during the 1985 discharge incident by EPA in the general Pittston and Tunnel mouth areas. In all areas sampled the highest concentrations reported were at least 1,000 times lower than threshold limit values, and EPA concluded that the airborne concentrations measured were indicative of normal atmospheric conditions. Also during the 1985 discharge incident, airborne samples from certain of the exploratory boreholes were analyzed by EPA. The highest concentrations reported were in the low ppb range; 1,000 times lower than threshold limit values (Phase I RI; Section 6.4).

The unique circumstances of the Butler Tunnel site problem effectively negate any involvement with, or effect on, the area's soils. With the possible exception of soil contact resulting from spillage in the immediate area surrounding the HWAS borehole, there was no substance-to-soil interaction along the travel path from the point of introduction to the Tunnel outlet.

Hazards assessments undertaken by EPA in 1982 and 1985, which assessments utilized the previously noted information and data, concluded a) that the groundwater and air routes did not require additional evaluation, b) the potential for fire and explosion of the waste was not a concern, and c) no sensitive surface water environments existed along the Susquehanna River downstream of the Tunnel (Phase I RI; Section 9.5). These assessments indicated that the route of environmental exposure considered to be of potential concern was the water borne route. Contaminants could reach the

Susquehanna River and its biota near the Tunnel; and possibly during major discharge events, the Danville potable water intake.

1.2 History Of Response Action

Previous response actions, enforcement activities undertaken by EPA, and reference documents have been identified in the Phase I RI report. It is felt at this time that "History Of Response Action" requirements are adequately addressed.

1.3 Site Visit

General site topography and the locations of receptors to possible contaminant release are presented in the Phase I RI report. It is felt at this time that these topics have been adequately addressed.

Certain of the tasks proposed for the Phase II RI will require a determination of property ownership and the negotiation of access agreements. In addition, the applicability of EPA access agreements negotiated during the 1979 and 1985 discharge incidents will have to be determined. Depending on the outcome, the Respondents may have to re-negotiate such agreements.

1.4 Define Boundary Conditions

Boundaries delineating the extent of potential public health and environmental exposure have been identified in the Phase I RI report. It is felt at this time that this topic has been adequately covered.

On the other hand, effort needs to be expended to attempt to define the hydrologic boundary within which surface and groundwater flows are contributing to Tunnel discharge volumes. This proposed work effort is further discussed in tasks 2.5 and 3.3.3.

1.5 Site Mapping

General site geophysical features have been mapped and described in the Phase I RI report. Such maps were prepared from readily available drawings and therefore vary in scale, degree of detail and other technical features. There is need for a project area base map to be prepared at a reasonable scale and with a generally accepted coordinate system. This base map would accommodate the presentation of a variety of project-specific information such as the locations of boreholes, mine pools, barrier pillars, coal outcrops and strip mines; and general surface and subsurface drainage patterns.

Environmentally sensitive areas and features have been adequately mapped and described in the Phase I RI report. It is felt at this time that this topic has been adequately addressed.

1.6 Site Office

The establishment of a site office is not contemplated at this time.

1.7 Subcontractor Procurement

It is anticipated that Gannett Fleming Environmental Engineers, Inc., on behalf of the Respondents, will subcontract a) all chemical analytical work, b) the collection and analysis of Susquehanna River benthic macroinvertebrate samples, and c) exploratory borehole drilling. U.S. Testing Company, Inc., Hoboken, New Jersey, a current participant in the EPA Contract Laboratory program, will be the subcontractor performing the chemical analytical work. Benthic macroinvertebrate work will be performed by RMC Environmental Services, Pottstown, Pennsylvania. The drilling subcontractor will be selected at such time as drilling specifications have been prepared.

TASK 2 - PLANS AND MANAGEMENT

2.0 Technical Approach

Actual and potential on-site and off-site public health and environmental concerns were evaluated by DER and EPA over the entire period of record covered by the Phase I RI report (July 1979/November 1985); and affected media and pathways of exposure were identified and evaluated during the course of both discharge incidents. To the extent that contaminants may still be present in the abandoned deep mine workings, the water-borne route of exposure was identified as being of potential concern. Available information and data indicate that this concern should be considered from the perspective of a) day-to-day Tunnel discharge quality, and b) the potential for episodic discharges which could adversely impact the Susquehanna River in the immediate vicinity of the Tunnel outfall. The resolution of these two issues is fundamental to any consideration of remedial alternatives. Therefore, the major Phase II RI efforts proposed by the Respondents address:

1) The determination of day-to-day Tunnel discharge quality,

2) An attempted refinement of the volume and characteristics of oil and aqueous phase liquids injected into the HWAS borehole and,

3) An extension, and re-evaluation, of prior EPA hydrogeologic studies and investigations.

To complement the determination of day-to-day Tunnel discharge quality, the collection and analysis of Susquehanna River water and sediment samples is also proposed.

The refinement of liquid volumes injected into the HWAS borehole; along with the findings and conclusions resulting from a) initially drilling three new exploratory boreholes, b) analyzing liquid samples from various

exploratory boreholes and c) further hydrogeologic study of the Butler Tunnel site would serve as the basis for assessing the extent to which contaminants may continue to be present in the abandoned deep mine workings. Findings and conclusions resulting from these proposed investigations and studies would be evaluated with EPA to assess the necessity for additional field investigations.

In addition to these major Phase II RI efforts, the Respondents propose to gather additional information and data that would be of potential use for the feasibility study.

2.1 Day-To-Day Tunnel Discharge Quality

Physical, chemical and biological processes occurring within the underground mine environment have undoubtedly been reducing the concentration and/or altering the composition of compounds attributed to discharges into the HWAS borehole. Certain of these processes simply alter the location of pollutants by exchanges between water, surfaces and air to maintain equilibrium conditions; others offer the potential for chemically altering the pollutants.

Groundwater conditions, site geology, the physical condition of the workings, and the location and extent of mine pools undoubtedly influence the underground hydraulic regime. In underground areas disturbed by past mining, the natural groundwater flow system has been severely altered. Groundwater flow in such areas occurs through open and collapsed mine voids, drainage boreholes and tunnels, and fractured bedrock. In low areas or in places with obstructed outlets, water is impounded in mine pools. The collective impact of these conditions has apparently resulted in a variety of contaminant flow paths and discharge conditions for soluble and insoluble waste constituents.

The natural environmental processes occurring within the underground mine environment and the various hydrogeologic conditions, singularly and collectively, have apparently been playing a role in reducing the quantity, and attenuating the movement of contaminant loads discharged into the HWAS borehole. Their collective impact over time could reasonably be expected to result in an overall improvement in Tunnel discharge quality. The

environmental processes by themselves have undoubtedly reduced water-soluble constituents to the extent that minimal amounts would be anticipated to remain. Available analytical data substantiate these observations.

Available information and data indicate that the major impact of the 1979 and 1985 discharge incidents on Susquehanna River water and sediment quality was, with the exception of oil, limited to the immediate vicinity of the Tunnel outfall. With few exceptions, said data further show that Tunnel discharges over the period of record have met DER effluent guidelines (Phase I RI; Sections 8.3.4. and 1.5.7). Additionally, analytical data collected during the course of the 1985 discharge incident show that the majority of organic constituents attributed by EPA and DER to wastes injected into the HWAS borehole were not detected in Tunnel discharge water-phase samples (Phase I RI; Section 9.1). Most pollutant concentrations, even in the most contaminated mine pool samples from 1985/1986, were in the low ppb range (Phase I RI; Sections 3.3.3 and 4.5.3). To the extent that wastes injected into the HWAS borehole in 1978/1979 remain in the abandoned deep mine workings, it would appear that said wastes are being dissipated at a low rate from a multiplicity of locations within the workings. Therefore, there is reason to believe that day-to-day Tunnel discharges may be of acceptable quality, or approaching acceptable quality. Additional Tunnel discharge sampling over a reasonable range of discharge rates should substantiate this observation.

Tunnel discharge rates would have to be obtained at the time of sample collection. One of the major problems in evaluating previous work accomplished at the Butler Tunnel site has been the lack of continuous and reliable flow data. To assist in the development of a reliable data base, at least for the duration of the proposed sampling program, it is further proposed that a continuous flow measuring and recording system be installed.

2.1.1 Background Constituents

Prior studies and investigations have identified potential sources of mine water contamination, both man-made and natural. Although Tunnel discharges were sampled and analyzed prior to the 1978/1979 time period, no

analyses were apparently performed for organic constituents. It is acknowledged that a baseline contaminant level must be established when addressing the issue of acceptable Tunnel discharge quality. Respondents therefore propose the sampling and analysis of two other mine drainage discharges in the general area of the Tunnel discharge; namely, the Duryea Outfall and the Buttonwood Outflow. Analysis of discharge quality at these locations will assist in establishing Tunnel background conditions. The Duryea and Buttonwood discharges are located on Figure 3-1.

2.2 Oil Quantities

The single issue that potentially has the greatest impact on the development of remedial alternatives is the quantity of oil injected into the HWAS borehole and the extent to which such oil may remain in the abandoned underground workings.

Although information and data are currently available to enable a variety of defensible opinions to be put forth relative to the issue of waste oil volumes, said information and data do not at this time enable a definitive conclusion to be drawn relative to the extent to which oil injected into the HWAS borehole in 1978 and 1979 may still remain in the abandoned mine workings. Because of a) the tenuous nature of the estimated volume discharged into the borehole and from the Tunnel, b) the probability of unreported episodic events, c) the effect of natural environmental process within the workings, and d) the knowledge that extensive underground exploration has not identified the existence of any large volume it could even be reasonably argued that the bulk of the oil discharged into the borehole may well have been purged from the abandoned mine workings. The Respondents therefore propose the further assessment of available information and data, and the attempted gathering of additional information and data to try to achieve a more definitive "oil balance" conclusion.

Inherent in the consideration of oil quantity injected into the HWAS borehole is an assessment of aqueous volume. Assuming that efforts proposed by the Respondents enable a more definitive "oil balance" conclusion to be derived, said conclusion will also enable a more definitive identification of

the aqueous volume discharged into the borehole. In addition, all potential contaminants will be considered when the proposed further study of hydrogeologic conditions, and the exploratory borehole sampling program are undertaken.

2.2.1 Oil Discharges Into HWAS Borehole

Syracuse shipments to the HWAS borehole are fairly well documented from manifests and deposition testimony. The extent of Edgewater shipments on the other hand are much less clear. Because of the potential impact of Edgewater shipments on the oil balance issue, an attempt will be made by the Respondents to refine and expand upon currently available information and data.

A second aspect of the oil balance issue that needs to be further explored pertains to the efficiency of the oil recovery processes at Syracuse amd Edgewater. There is some indication that the city of Syracuse sampled wastewater discharges from the hauler's terminal. If such records exist, they would enable a more definitive estimate to be made of the oil content of discharges into the HWAS borehole. The availability of such wastewater discharge records for the Edgewater facility could also be determined.

2.2.2 Location Of Remaining Oil In Abandoned Workings

The location and quantity of oil, if any, that may be remaining in the abandoned mine workings complements the efforts proposed in task 2.2.1.

To the extent that oil from 1978/1979 discharges into the HWAS borehole may remain in the abandoned underground mines, such oil could be trapped in subsided workings or have become bound to the extensive surface area in the mines. There are serious questions about where and if any concentrated volume(s) of oil and other contaminants can be located. Available information would indicate that the potential locations of wastes are difficult to define, and the quantity that could be potentially removed from any location would be even more difficult to determine. These expectations were subsequently confirmed by three hydrogeologic studies, and related field investigations undertaken by EPA. Study results are not unexpected in light of past

underground mining activities which have created a physical condition of such complexity that the identification of pollutant pathways and repositories, within the context of reasonable investigation efforts, may not be possible.

The hydrogeologic study report addressing the 1985 discharge incident recommended the drilling of a minimum of eleven new exploratory boreholes in a further attempt to identify the location of contaminants, but gave no indication of whether the additional drilling could reasonably be anticipated to identify any or all remaining pockets of contaminants or would be just one in a series of additional drilling efforts. On the basis of a review of available hydrogeologic information and data, the Respondents propose the initial drilling of two additional boreholes in an attempt to locate accumulations of contaminants. One borehole would be drilled to intercept the free water surface in the Red Ash Pool near a potential point of overflow to the Tunnel system. Oily contaminants, if present on the surface of this pool, could spill into the Tunnel under certain hydrologic conditions. Previous drilling was not successful in sampling the surface of the pool and it is therefore unknown if contaminants are present. The second hole would be drilled into the Stark Vein at a point where water and contaminants may be trapped near the down-slope limit of the workings. Under certain hydrologic conditions, trapped fluids could spill into the Red Ash workings and eventually reach the Tunnel system. The initial drilling of additional holes would be based on speculation; therefore none are proposed.

Prior hydrogeologic studies and investigations have indicated the presence of one general migration pathway for contaminants discharged into the HWAS borehole. This pathway is believed to drain to the head end of the Butler Colliery drainage ditch that in turn discharges into the Tunnel. A prior attempt to drill a borehole into the drainage ditch downstream of its confluence with the general migration pathway was not successful. It is proposed that the third borehole be drilled in an effort to again penetrate the drainage ditch. This borehole would assist in confirming the presence of at least one migration pathway, and the extent to which pollutants might still be migrating along this pathway to the drainage ditch and Tunnel.

Two of the three initially proposed boreholes are intended to access free water surfaces, and the third is intended to access the Butler Colliery drainage ditch. Respondents acknowledge that more than one borehole at each site may prove to be necessary to achieve the target objective. Should initial drilling be unsuccessful, drilling results would be evaluated with EPA prior to installation of a second borehole to assess the advisability of altering the drilling plan.

2.2.3 Further Study Of Hydrogeologic Conditions

Except for the two boreholes proposed for the Red Ash Pool and Stark Vein, Respondents' review of prior hydrogeologic studies and investigations does not establish any justification for additional boreholes to be drilled in an attempt to locate contaminant accumulations. EPA though has expressed concern relative to the depth and extent of prior studies and investigations, and feels that the prior efforts need to be expanded upon. Respondents therefore propose to independently study abandoned underground mine conditions to attempt to further define potential routes of contaminant migration from the HWAS borehole and potential areas of contaminant accumulation. Such study would address underground areas both up- and down-gradient of the Butler Colliery drainage ditch.

2.2.4 Exploratory Borehole Sampling

Hydraulic flushing, dilution and communication routes between mine pools and mine drainage pathways along with natural environmental processes apparently have had a significant impact on the movement and dissipation of contaminants. Therefore, the sampling and analysis of liquids from each of the initially proposed, and certain of the existing exploratory boreholes will be undertaken to a) determine oil and other contaminant content, and b) attempt to confirm current indications of the migration of low levels of contaminants through the abandoned underground workings. Additionally, Respondents will assess the feasibility of attempting to collect sediment samples from existing boreholes.

Another major problem in evaluating previous work accomplished at the Butler Tunnel site has been the lack of continuous borehole water level data. To assist in the development of a reliable data base, at least for the duration of the sampling program, it is further proposed that a secured continuous measuring and recording system be installed in each of the initially proposed, and certain of the existing exploratory boreholes.

The selection of certain existing boreholes for sampling is based on the premise that they are still in existence and are physically suitable for their intended purpose. The actual condition of each borehole will not be known until it is internally examined. The results of these internal investigations will be evaluated with EPA to assess the necessity to alter or amend the monitoring plan.

2.3 Susquehanna River Investigations

The results of prior investigations show that Susquehanna River water, sediment and biota are adversely affected by the Lackawanna River, urban runoff, combined sewer overflows and mine drainage. Tunnel discharges on the other hand have not been identified as having a long-term measurable impact (Phase I RI, Section 5.4). To obtain a general indication of the apparent level of contamination and environmental quality of the Susquehanna River in the vicinity of the Tunnel discharge, Respondents propose water, sediment and macroinvertebrate sampling and analysis. To complement this effort, Respondents will solicit from DER information pertaining to planned changes in Susquehanna and Lackawanna River water quality criteria.

2.3.1 Surface Water

On-going Susquehanna River water quality studies have generally quantified biological and inorganic parameters, not organic parameters. Because of the absence of Susquehanna River water quality organic analyses, the Respondents propose the collection and analysis of River water samples at three transects; namely, upstream of the Tunnel, at the Tunnel discharge and downstream of the Tunnel. Sampling would be undertaken during a period of

low River flow, and during a period of high flow. These analytical data would be of utility in addressing the issue of acceptable Tunnel discharge quality.

EPA has expressed a desire to repeat 1980 toxicity testing utilizing Susquehanna River water from the boundary of the mixing zone. At such time as the extent of the mixing zone has been agreed upon, Respondents will collect a River water sample and forward such sample to the EPA bioassay laboratory at Wheeling, West Virginia. This laboratory conducted the 1980 testing, and would be expected to furnish Respondents with the sampling and transport protocol. A copy of the test results would be made available to the Respondents.

Respondents note that a "mixing zone" regulation has not been prepared by DER. It is therefore acknowledged that discussions will be held with DER to agree to the definition of a mixing zone for the Butler Tunnel site, or to establish the scope of an investigation to quantify its extent.

2.3.2 Sediments

At such time as Susquehanna River water samples are collected during the low flow period, Respondents propose to collect and chemically analyze near-shore sediment samples from the same transects. These analytical results, to the extent possible, will be compared with the results of prior DER and SRBC efforts and assessed in light of other known discharges into the River.

Respondents further propose benthic macroinvertebrate sampling and analysis to develop data regarding the number of organisms, and species diversity. Near-shore macroinvertebrate sampling will be undertaken at the same time and in the same transects established for the collection of sediment samples for chemical analysis. Macroinvertebrate analytical results, to the extent possible, will be compared with the results of the 1982 SRBC effort and assessed in light of other known discharges into the River.

2.4 Hydrologic Investigation

Tunnel discharges are the result of a hydrologic regime created by the interaction of various physical conditions; namely a) the influx of ground and

surface water from upgradient recharge areas tributary to general contaminant migration paths in the Butler Colliery workings, b) direct infiltration of precipitation on surface areas overlying mine workings hydraulically tributary to the Tunnel and the movement of this water through the workings, c) evaporation-transpiration uptake rates, d) ambient air and ground surface temperatures, and e) soil moisture content. The sensitivity of Tunnel discharge and quality to these conditions has not been quantitatively described.

Prior hydrologic study efforts have attempted to statistically correlate rainfall with other hydrologic parameters. Although these efforts were not successful, primarily due to the lack of an adequate data base, they did indicate that a direct though non-quantified relationship exists between storm events, Tunnel discharge rates and contaminant loadings. Flushouts or episodic events at the Tunnel normally have been associated with high discharge rates in combination with above-normal precipitation events and/or periods of high groundwater levels. While a variety of conditions could trigger a release of contaminants, the long-term trend is apparently toward release caused by high flow throughout the Tunnel system (Phase I RI; Section 4.5).

As noted in tasks 2.1 and 2.2.4, the gathering of additional hydrologic data is proposed during the course of sample collection. To complement these data, Respondents further propose the installation of a continuous-recording tipping bucket rain gauge in the vicinity of the Butler Colliery. At such time as these additional data have been gathered, the Respondents propose to expand upon prior attempts to develop a statistical cause-effect hydrologic relationship. As a minimum, the results and insights gained from this effort could be used to better define the extent of additional data collection necessary to improve the chances of developing the relationship, and the time period over which such data would probably have to be collected.

Prior to terminating the gathering of hydrologic data, the advisability of extending its collection beyond the currently proposed one-year period will be evaluated with EPA.

2.5 Surface Water And Groundwater Migration Routes

Groundwater recharge is primarily due to the infiltration of precipitation on a regional basis, and streamflow losses from streams crossing steeply dipping rock outcrops and disturbed coal veins in upland recharge areas. Tunnel flow also originates from surface water that has infiltrated into the underground workings from surface sources such as poorly restored strip mines, fractured and fissured overburden, and subsidence areas along the coal outcrops high on the limbs of the synclinal structure (Phase I RI; Sections 4.4 and 5.2).

In underground areas disturbed by past mining activity, it can be reasonably concluded that the natural groundwater flow system has been severely altered. The physical condition of the abandoned mines has resulted in the creation of multiple flow paths for groundwater movement between upland recharge areas and discharge points along the Susquehanna River. Even though the identification of groundwater movement routing within the abandoned deep mine workings may be extremely difficult if not impossible, there does appear to be justification for identifying the limits of the surface and subsurface areas having the potential to contribute water to the Tunnel system. Utilizing available information and data, the further study of Butler Tunnel site hydrogeologic conditions described in task 3.3.3 will attempt to identify the Tunnel hydrologic boundary limit and general ground water migration routes.

2.6 Budget

The Respondents will prepare individual task budgets prior to task implementation.

2.7 Personnel Requirements

Respondents have determined that personnel resources are available to perform work on the various tasks in accordance with the proposed schedule.

2.8 Schedule

The proposed Phase II RI schedule is presented in Appendix A. Said schedule has been prepared from what the Respondents feel is a realistic assessment of the proposed level of effort. Although all reasonable effort will be expended to meet the proposed schedule the actual time consumed will to varying degrees be affected by conditions over which the Respondents have no control, and by field investigation and data gathering decisions made during the course of the Phase II RI.

Respondents note that several tasks have a significant impact on the schedule. The monitoring and analysis of exploratory borehole liquids and Tunnel discharges for a 13-month period are the most time consuming tasks; accounting for almost 50 percent of the total schedule time. In order to attempt a correlation of borehole and Tunnel data, these monitoring tasks are to be undertaken concurrently. Certain other tasks though must be undertaken and completed before the monitoring programs can commence. Before property entry will be attempted, rights-of-entry must be obtained. While securing rights-of-entry, Respondents will be preparing, and EPA will be reviewing, program designs for the initially proposed new boreholes, and for the monitoring of all borehole liquids. Upon securing right-of-entry agreements, and EPA approval of program designs, Respondents can then commence a) field surveys for all boreholes, b) preparation of specifications for drilling new boreholes, c) internal examination of existing boreholes, d) clearing the Tunnel mouth, and e) establishing the site datum. In light of unknown physical conditions, the preparation of specifications for monitoring equipment should not be undertaken until the internal examination of existing boreholes and the clearing of the Tunnel mouth are completed. On the basis of recent experience the times allocated for equipment delivery, installation and calibration are realistic. It is noted that other tasks will also be undertaken during the time scheduled for the preparation and implementation of these monitoring efforts.

Respondents further note that a substantial gathering of information and data is proposed for the Phase II RI. The assessment of information and data not dependent upon field investigation results will be completed by the time

the borehole and Tunnel monitoring tasks are terminated. Although assessment of information and data from proposed field investigations will commence prior to completion of the investigations, the quantity of data generated is such that its assessment will extend beyond termination of the investigations. Furthermore, the results of Phase II RI investigations and studies may necessitate a re-evaluation of Phase I RI findings and conclusions. On the basis of these considerations, and adequate time for EPA review, the Phase II RI report schedule is considered to be realistic.

2.9 Quality Assurance Project, Sampling, Health And Safety, And Data Management Plans

The quality assurance project, sampling, health and safety, and data management plans are presented in Appendices B, C, D and E, respectively.

TASK 3 - SITE INVESTIGATION

3.0 Scope

Particulars pertaining to the Phase II RI efforts proposed by the Respondents in task 2 are set forth in this task 3. The primary objective in undertaking this work is the generation of information and data of adequate technical content to better assess the applicability and utility of remedial alternatives to be evaluated during the feasibility study; and secondly, to gather additional information and data for potential use in the development of these remedial alternatives.

3.1 Tunnel Gaging And Sampling

In developing the proposed gaging and sampling plan, two major operational problems were assessed; namely, the fluctuation in Susquehanna River level and the corrosive nature of Tunnel flow. Over the past seven years it is estimated that River levels have surcharged the existing sandbag barrier located inside the Tunnel for 10 percent of the time. Furthermore, because of the proximity of the Tunnel mouth to the normal edge-of-River, foot access to the mouth would not be possible at other River levels not surcharging the sandbag barrier. The corrosive nature of Tunnel flow to sensitive instrumentation, along with problems created by the fouling of automatic sampling equipment has been documented by DER (Phase I RI; Section 8.4).

3.1.1 Gaging

After removal of the existing sandbag barrier, and cleaning of the inside Tunnel mouth area, it is proposed that a rectangular weir be placed at or close to the mouth. Weir crest height would be established to maximize its elevation before surcharging by the River, and yet allow for the free flow from the Tunnel of some 20-30 mgd or more. Depth of flow over the weir would be measured by a continuous water-level recorder installed over the existing 30-inch borehole. Prior to installation of the gaging system, critical

hydraulic elevations would be obtained and placed on a common datum, and hydraulic design dimensions of the Tunnel interior obtained in the area of the proposed weir.

When measuring Tunnel discharge rate, three hydraulic conditions must be anticipated:

1) River levels which allow free flow over the weir.

2) River levels which partially submerge the weir.

3) River levels which completely submerge the weir, and possibly the Tunnel entry.

In the first case, recorded water level elevations would be used with an appropriate weir formula to calculate Tunnel discharge rates. For the second and third conditions, current meter velocity measurements made upstream of the weir through the 30-inch borehole at the time of sample collection along with the cross-sectional area of flow would be used to calculate discharge rates. If River elevation is such that the Tunnel entry is surcharged, a direction-of-flow determination would be made upstream of the weir through the 30-inch borehole prior to obtaining velocity measurements.

The gaging of Tunnel flows would be undertaken concurrently with the sampling of Tunnel flows; namely, one year.

3.1.2 Sampling And Analysis

It is proposed that samples be manually collected on a bi-weekly basis (one sample every two weeks) for a period of one year. Samples would be obtained at the Tunnel entry, or when inaccessible, through the 30-inch borehole. Samples would also be collected through the 30-inch borehole even if a flow-reversal condition were determined to exist; namely, the flow of River water into the Tunnel. During one period each of relatively high and low Tunnel discharge rate, the bi-weekly sample will be analyzed for the hazardous substances list (HSL) constituents. Subject to adjustment pending

assessment of the HSL analyses, all other samples would be analyzed for oil and the 17 constituents identified in the Consent Order. As analytical data are accumulated, sampling frequency and the extent of sample analysis may, with the concurrence of EPA, be modified.

At such time as the sample for HSL analysis is collected during the period of relatively low Tunnel discharge rate, a second sample will be collected though the 30-inch borehole. This second sample will be analyzed for volatile organic compounds and the results assessed in light of the concentrations determined to be present in the Tunnel mouth sample.

During the course of the proposed gaging and sampling program rainfall data obtained from the gage installed in the vicinity of the Butler Colliery would be correlated with rainfall data from the National Weather Service Station at Avoca, and with Tunnel discharges. It may therefore be possible to forecast a surge in Tunnel discharge rate. During these periods of high flow, the Tunnel discharge would be sampled on a more frequent basis over the projected hydrograph time interval to determine a possible change in quality as the result of the predicted hydraulic surge. Should it appear that such forecasting could reasonably be undertaken, a plan for implementation would be prepared by the Respondents and submitted to EPA.

3.1.3 Background Constituents

The Duryea Outfall and Buttonwood Outflow will be sampled during one period each of relatively high and low discharge conditions. During each period, one sample will be collected and analyzed for oil and HSL constituents. Respondents will also attempt to measure discharge velocity and calculate discharge rate at the time of sample collection.

3.2 Discharges Into HWAS Borehole

Efforts proposed by the Respondents to attempt to better define the volume of oil, and aqueous phase constituents, discharged into the HWAS borehole consist of:

1) The gathering of additional information and data pertaining to liquid volumes administered through the Edgewater terminal and discharged into the HWAS borehole.

2) The review of Section 104(e) information and data received by EPA from potentially responsible parties subsequent to preparation of the Phase I RI report.

3) Research into the re-refining technology employed at the Syracuse and Edgewater terminals to better define the oil content of wastewaters hauled to the HWAS borehole. This effort would include a review of wastewater quality records, to the extent they may exist, for the Syracuse and Edgewater terminals.

Research into the extent to which natural environmental processes could reasonably have been expected to result in oil losses from the abandoned deep mine workings is also proposed. Such losses should be considered along with estimated oil quantities measured in Tunnel discharges in the further evaluation of the oil balance issue. The discussion of the results of these proposed efforts would be extended to address the conditions that could possibly be moderating the release of contaminants potentially remaining in the deep mine workings.

3.3 Hydrogeologic Investigation

Proposals for the initial installation of three new exploratory boreholes, and the gaging and sampling of these and certain of the existing boreholes are generally described in the following. The approximate locations of a) existing boreholes, including those installed in 1988 as part of the EPA/DER effort to establish Butler Colliery ambient conditions (2-Alt, 2-B and 2-C), and b) the three boreholes proposed herein, are shown on Figure 3-1.

3.3.1 New Exploratory Boreholes

The proposed borehole identified as 2-A, is intended to penetrate the Red Ash workings at approximately the position of the free water surface and will

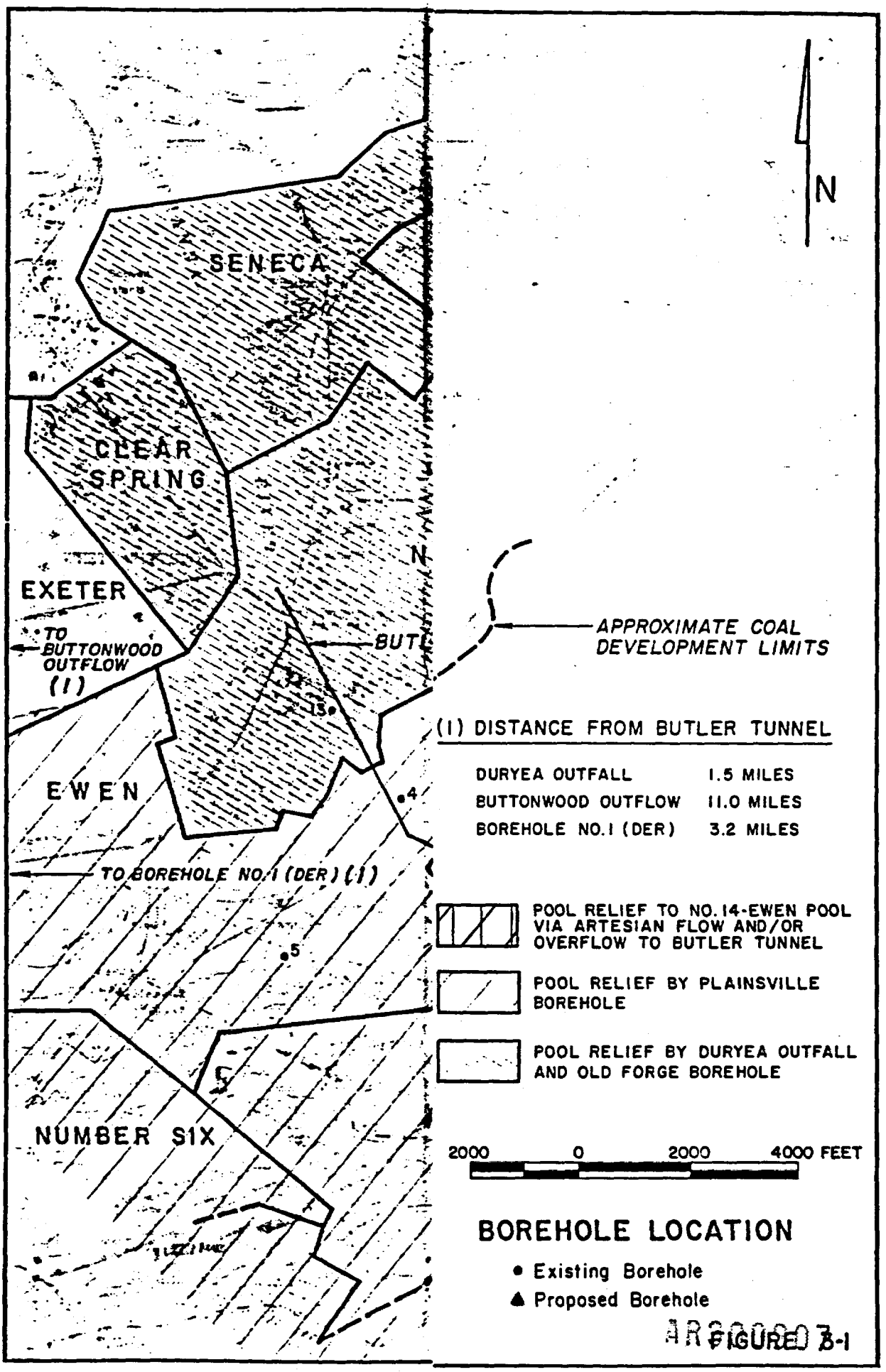


FIGURE 3-1

be located in the general vicinity of existing Borehole 2. Because this mine pool varies in level from time-to-time, the proposed borehole cannot be sited until near the time of construction. Water level readings will be taken at Borehole 2 at that time to determine the mine pool level. The proposed borehole is expected to be in the approximate range of 275 to 300 feet deep. This borehole may be installed by EPA as an adjunct to its 1988 flushing project monitoring, sampling and analytical effort. If installed by EPA, Respondents will utilize the borehole for the gaging and sampling work described in Task 3.3.2.

The second borehole proposed for construction is identified as S-1 in the EPA hydrogeologic report covering the 1985 discharge incident. It would penetrate the Stark vein at the structural basin and is expected to be in the approximate range of 190 to 200 feet deep.

The third borehole, identified as 8-A, is intended to penetrate the drainage ditch in the Red Ash vein. It is proposed to locate the hole downgradient from the identified general migration path but upgradient to the possible point of overflow for the Red Ash pool to the Tunnel system. The borehole is expected to be in the approximate range of 275 to 300 feet deep.

3.3.2 Borehole Gaging and Sampling

Borehole gaging would be undertaken concurrently with sampling; namely, one year. Gaging would be on a continuous basis over this period, and accomplished with continuous water level recorders. The specifics of the proposed gaging plan are set forth in Table 3-1.

It is further proposed that samples be manually collected on a bi-weekly basis for a period of one year. The first aqueous sample collected at each borehole will be analyzed for the HSL constituents. Subject to adjustment pending assessment of the HSL analyses, all other samples would be analyzed for oil and the 17 constituents identified in the Consent Order. As borehole accessibility is determined and analytical data accumulated, sampling locations, sampling frequency and the extent of sample analysis may, with the concurrence of EPA, be modified. The boreholes proposed for sampling are identified in Table 3-1.

TABLE 3-1

Exploratory Borehole Gaging And Sampling

Borehole	Continuous Water Level Recording Installation	Sampling
1	Yes. Measures hydrologic response of No. 14-Ewen pool levels in Red Ash workings in vicinity of Tunnel.	Yes. Free water surface of No. 14-Ewen pool is intercepted downgradient from relief point of Red Ash pool to be monitored by Boreholes 2 and 2-A. Determine potential migration route of water-soluble contaminants and water quality response to hydrologic changes.
2	Yes. Measures hydrologic response of Red Ash pool downgradient from drainage ditch to Tunnel. To be used until free water surface of pool is intercepted by Borehole 2-A.	Yes. Determine potential migration route of water-soluble contaminants and water quality response to hydrologic changes.
7	Yes. Measures hydrologic response of mine water in Red Ash workings in contaminant migration pathway up-gradient and near drainage ditch to Tunnel.	Yes. Determine water quality response to hydrologic changes.
10	Yes. Measures hydrologic response of mine water in Red Ash workings in contaminant migration pathway down-gradient to Borehole 7 and up-gradient to drainage ditch to Tunnel.	Yes. Determine water quality response to hydrologic changes.
11	Yes. Measures hydrologic response of mine water in Bottom Red Ash workings in contaminant migration pathway downgradient from HWAS borehole and upgradient to Borehole 12 and drainage ditch to Tunnel.	Yes. Determine water quality response to hydrologic changes.
12	Yes. Measures hydrologic response of mine water in Bottom Red Ash workings in contaminant migration pathway downgradient from Borehole 11 and upgradient to drainage ditch to Tunnel.	Yes. Determine water quality response to hydrologic changes.

TABLE 3-1 (continued)

Exploratory Borehole Gaging And Sampling

Borehole	Continuous Water Level Recording Installation	Sampling
13	Yes. Measures hydrologic response of No. 9 pool in Pittston workings in vicinity of Tunnel.	Yes. Determine water quality response to hydrologic changes.
49(DER)	Yes. Measures hydrologic response of No. 9 pool, approximately 0.8 mile from Tunnel. To be used until correlation with Borehole 13 is established.	No. Water quality response of No. 9 pool to hydrologic changes to be determined at Borehole 13.
1(DER)	No. Borehole located 3.2 miles from Tunnel. Existing water level data correlates well with Borehole 1 data. Spot elevations to be obtained during gaging and sampling program.	No. Water quality response of No. 14-Ewen pool to hydrologic changes to be determined at Borehole 1.
HWAS	Yes. Measures hydrologic response at mine water in Stark workings at original contaminant source.	Yes. Determine water quality response to hydrologic changes.
2-A(Proposed)	Yes. Measures hydrologic response of Red Ash pool downgradient from drainage ditch to Tunnel.	Yes. Proposed borehole to intercept free water surface of pool to determine potential migration path of contaminants and water quality response to hydrologic changes.
S-1(Proposed)	Yes. Measures hydrologic response of mine water in Stark workings overlying Red Ash workings in vicinity of drainage ditch to Tunnel	Yes. Proposed borehole to determine potential migration path of contaminants and water quality response to hydrologic changes.
8-A(Proposed)	Yes. Measures hydrologic response of mine water in Red Ash diversion ditch to Tunnel downgradient from Boreholes 7 and 10 but upgradient to potential overflow point of Red Ash pool to be monitored by Boreholes 2 and 2-A.	Yes. Determine water quality response to hydrologic changes.

EPA in July 1987 sampled six of the existing boreholes listed in Table 3-1. The report setting forth the results of that sampling and analytical effort made note of the fact that none were secured, and most were open to the environment. This condition is to be considered in assessing the borehole analytical data gathered from the proposed sampling effort.

3.3.3 Further Study Of Hydrogeologic Conditions

As set forth in Task 2.2.3, Respondents initially propose the drilling of three new exploratory boreholes, and concurrently, a study of abandoned underground mine conditions to attempt to further define potential routes of contaminant migration from the HWAS borehole and potential areas of waste accumulation. The study would be comprised of a) the reassessment of findings and conclusions resulting from prior investigations and studies, b) an evaluation of information and data obtained from drilling the three proposed boreholes, and c) an independent review and evaluation of available information and data.

Information and data from mine maps, geologic maps, borehole logs, pool elevation records, aerial photographs, and knowledgeable regulatory and coal company personnel will be assessed in undertaking the independent study of hydrogeologic conditions. It is anticipated that said information and data would be in sufficient detail to enable the Respondents to evaluate:

1) Coal vein configuration (outcrops/structure contours)
2) Extent of mining
3) Condition of mine workings
4) Condition and type of overlying strata
5) Underground physical features (barriers, entries, interconnections, extent of mine pools)
6) Mine pool fluctuations
7) Topographic features
8) Extent of surface mining and reclamation
9) Extent of subsidence
10) Streambed conditions

Potential sources for this information and data will consist of the Pennsylvania Mining, Heidelberg and Hudson Coal Companies; Federal Office of Surface Mining Reclamation and Enforcement; Pennsylvania Geologic Survey; Luzerne County Planning Commission; U.S. Geological Survey; Pennsylvania Department of Transportation; DER Bureau of Mining and Reclamation; and DER Bureau of Abandoned Mine Reclamation.

The results of this proposed hydrogeologic study would serve as the basis for identifying the need for further investigations, such as the drilling and sampling of additional exploratory boreholes, or the use of a tracer to attempt to confirm contaminant route migration conclusions. Study results would be reviewed with EPA, and to the extent requested by EPA, with federal Bureau of Mines and Office of Surface Mining Reclamation and Enforcement personnel. To assist in assessing the information and data pertaining to underground conditions, Respondents will prepare pertinent cross section views of the mine system along with maps of affected coal veins; such views and maps covering applicable portions of the system down-gradient of the drainage ditch.

3.4 Surface Water Investigation

Susquehanna River water sampling is proposed during a period of low flow, and during a period of high flow. It is recognized that sampling during a high flow period may have to be adjusted because of safety considerations.

The Susquehanna River in the Pittston area has a width of approximately 1,000 feet. The River will be sampled at three locations; namely upstream of the Tunnel discharge, at the Tunnel discharge and downstream of the discharge. Subject to field verification, these transects would be located respectively at accessible sites approximately 2,000 feet upstream, 100 feet downstream and 2,000 feet downstream of the Tunnel discharge. Such sites are downstream of the confluence of the Susquehanna and Lackawanna Rivers, within the portion of the Susquehanna River that is not generally well mixed. It is estimated that the water quality effect of the Lackawanna River will be confined to one-half of the width of the Susquehanna River along its eastern shore.

It is proposed that a surface sample, and a depth-integrated composite sample be taken at near-shore, and 250 and 500 feet intervals from the east bank of the Susquehanna River. At each of the three stations in the transect the surface sample would be analyzed for oil, and the composite sample would be analyzed for HSL constituents.

3.5 Hydrologic Study

At such time as the Tunnel discharge and exploratory borehole water level data described in Tasks 3.1.1 and 3.3.2 are collected, all available hydrologic data would be explored for statistical correlations. It is proposed that a graphical multivariable coaxial approach be utilized in lieu of the two-variable correlations previously attempted. As a minimum, an attempt would be made to correlate on both a macro- and micro-scale a) precipitation, b) borehole water levels, c) seasonality parameters and d) Tunnel discharge for significant hydrologic events.

3.5.1 Tunnel Discharge Quality Sensitivity

Concurrently with the attempted correlation of the previously noted hydrologic data, Respondents would also attempt to establish the sensitivity of Tunnel discharge quality to these hydrologic data.

3.6 Soils and Sediments Investigations

The extent of work proposed by Respondents to investigate soils and sediments is set forth in the following.

3.6.1 Soils

Because of the limited extent of substance-to-soil interaction noted in task 1.1.3, no soil investigations are proposed.

3.6.2 River Sediment Sampling

Near-shore River sediment samples will be collected in each of the

transects identified in task 3.4 Penetration depth will be limited to a few centimeters. Such sampling will be undertaken during the low flow period utilized for River water sampling, currently anticipated to be late summer or early fall. Each sediment sample will be analyzed for oil and for the HSL constituents. In order to normalize the sediment data, pH, oxidation-reduction potential, grain size distribution, percent moisture, and total organic carbon content will be determined for each sample.

At the same time as River sediment samples are collected for chemical analysis, an evaluation of the benthic macroinvertebrate community in the Tunnel vicinity will be performed. Near-shore sample stations in the three transects will be selected by biologists on the basis of field observations. Benthic macroinvertebrates will be sampled quantitatively using replicated Portable Invertebrate Box Sampler samples taken in shallow, flowing water. A qualitative kick sample also will be collected to determine to a greater extent the structure of the macroinvertebrate community.

3.6.3 Borehole Sediment Sampling

Due to the unknown physical condition of existing boreholes, Respondents will conduct an internal inspection by television camera before undertaking the monitoring program described in task 3.3.2. On the basis of this inspection, Respondents will determine the extent to which sediment samples could reasonably be collected and review these conclusions with EPA. To the extent that samples are collected, such would have to be accomplished prior to installation of the borehole water level recorder. Pertinent visual observations of the liquids scanned by the camera will be recorded.

Sample recovery techniques will vary with the nature of materials encountered but will generally include the use of bailers, sample spoons and conventional drilling tools. While drilling new boreholes, drill cuttings and returning fluids will be visually examined for contamination and sampled. These observations will serve as the basis for a recommendation to EPA pertaining to the proposed extent of analytical work.

3.7 Air Investigations

Prior air investigations have been summarized in task 1.1.3. On the basis of the results of these efforts, no further investigations are proposed.

TASK 4 - SITE INVESTIGATION ANALYSIS

4.0 Site Studies And Investigations

As noted in task 2.0, the Respondents have identified two issues that significantly affect the future consideration of remedial alternatives; namely, the quality of day-to-day Tunnel discharges and the extent to which oil and other contaminants injected into the HWAS borehole in 1978/1979 may possibly remain in the abandoned deep mine workings. The Respondents' current assessment of these two issues, from the perspective of potential feasibility study activities, is set forth in the following:

1) The Respondents acknowledge that upon completion of the proposed Tunnel discharge sampling work, acceptable discharge quality to surface waters must be determined by reference to, among other considerations, a) relevant and appropriate discharge and water quality standards approved under the federal Clean Water Act, b) implementing state regulations for point sources of this type and for this section of the Susquehanna River, and c) discharge permit requirements imposed on active coal mining operations in the area, as well as discharge quality from abandoned mines in the area. If sampling results demonstrate that day-to-day discharges are of acceptable quality, there would probably be no need to further consider this aspect of the Butler Tunnel site problem. If day-to-day discharges are deemed not of acceptable quality, available analytical data would indicate that constituent concentrations measured during the course of the proposed sampling program should still be in the low ppb range. Other potential sources of mine water contamination, both man-made and natural, have been identified (Phase I RI; Sections 2.3, 3.3.1, 3.3.3, 3.4.2., 4.3.3, 4.4.1, 4.5.2.2 and 6.3.1). Pollutants from these other sources would reasonably be expected to be low-level contributors to the concentrations measured in Tunnel discharges. Therefore, if day-to-day Tunnel discharges

are not of acceptable quality, the Respondents may wish to apportion responsibility for the levels of contaminants over which they have no control.

2) Considerable effort has already been expended by EPA in an attempt to locate oil and other contaminants in the abandoned underground workings that might remain from 1978/1979 discharges into the HWAS borehole; and to determine the migration pathways that such contaminants, to the extent they may exist, might traverse in being conveyed to the Tunnel drainage system. These prior efforts, comprised of studies and field investigations, failed to locate significant accumulations and migration pathways in a definitive manner. Within the context of realistic expenditures of effort, it just may not be possible to make such identifications for the reasons set forth in tasks 2.2.2 and 2.5. EPA though has expressed concern relative to the depth and extent of prior studies and investigations, and feels that the prior efforts need to be expanded upon. Respondents therefore propose the initial drilling of three new exploratory boreholes, and concurrently, an independent study of abandoned underground mine conditions to attempt to further define potential routes of contaminant migration from the HWAS borehole and potential areas of contaminant accumulation. This study effort would include the re-assessment of findings and conclusions resulting from prior hydrogeologic efforts. The results of this study would serve as the basis for identifying the need for further investigations, including the drilling and sampling of additional exploratory boreholes.

Respondents' assessment of available information and data indicates that "oil balance" and hydrogeologic findings will both have to be relied upon in assessing the potential for future episodic discharges. Respondents will therefore supplement the proposed hydrogeologic study and investigations with further study of the quantity of oil and other contaminants discharged into the HWAS borehole. The findings from this latter study would be integrated

with findings from the proposed hydrogeologic study and investigations. Conclusions would be reviewed with EPA and a decision made pertaining to the need for additional effort.

4.1 Analysis Of Findings

Findings resulting from all proposed Phase II RI efforts will be analyzed and summarized in a Phase II RI report. Inherent in this analysis would be the re-assessment of Phase I RI findings and conclusions in light of information and data developed during the Phase II RI.

TASK 5 - LABORATORY AND BENCH-SCALE STUDIES

Past efforts expended by EPA to identify and evaluate the effectiveness of various processes for the treatment of Tunnel discharges and mine pools are described in the Phase I RI report (Phase I RI; Sections 8.2 and 8.3). Currently available information and data cast doubt on a) the current applicability of the treatment processes previously studied, and b) the applicability of treatment as a viable remedial alternative.

The problems associated with the Butler Tunnel site are unique. In preparation for the potential need to consider some type of physical remedial technology as part of the feasibility study, the Respondents propose to undertake a literature search to a) determine if a hazardous waste site with similar conditions has been studied, and b) identify potentially feasible remedial technologies. The information derived from this literature search will be evaluated in light of the Butler Tunnel site conditions.

TASK 6 - REPORTS

Monthly progress reports will be prepared by Respondents and submitted to EPA-Region III. Said reports will set forth a) a description of actions taken, b) schedule status, c) information and data generated or received, d) activities scheduled for the next monthly period, and e) problems encountered and corrective actions taken.

Toward the completion of proposed Phase II RI studies and investigations, the format for presenting findings and conclusions will be discussed with EPA. This discussion would also establish EPA's desire for the initial submittal of a preliminary report. It is currently anticipated that the results of the proposed studies and investigations will be set forth in a separate Phase II RI report. Said report will address, but not by way of limitation, a) the results of the re-assessment of prior hydrogeologic studies and investigations, b) the potential for future releases of contaminants attributable to 1978/1979 HWAS borehole discharges, c) contaminant trends as evidenced by exploratory borehole and Tunnel discharge samples, d) the movement of contaminants through the deep mine workings, and e) the effect of natural environmental processes in reducing contaminant concentrations.

TASK 7 - COMMUNITY RELATIONS SUPPORT

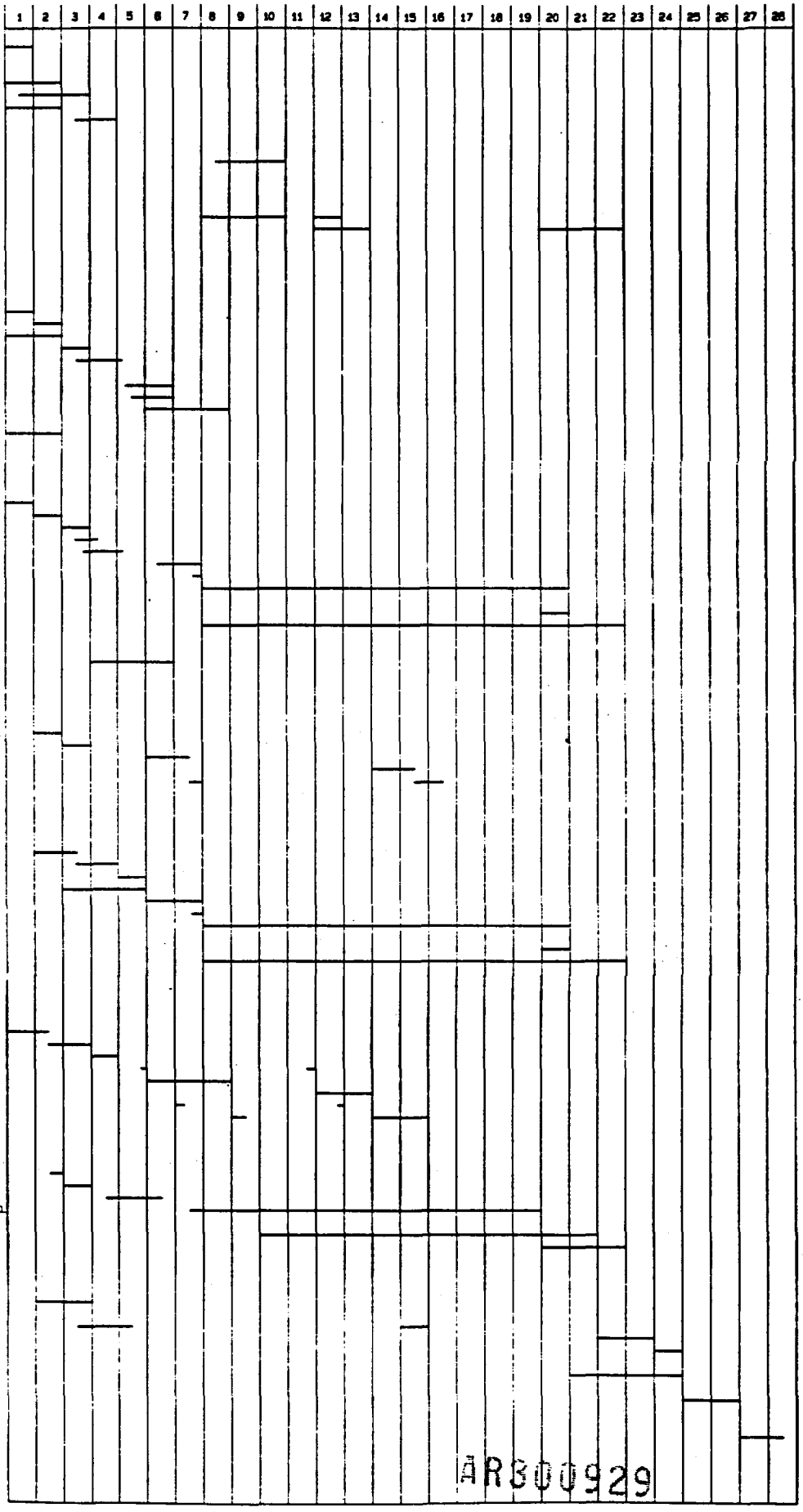
The Respondents will provide support to EPA's community relations activities as requested by EPA.

APPENDIX A

PHASE II RI AND FS SCHEDULE

PHASE II REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
BUTLER MINE TUNNEL SITE SCHEDULE

MONTH (ELAPSED TIME FROM RESPONDENTS' IMPLEMENTATION NOTIFICATION TO EPA)



APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

BUTLER MINE TUNNEL SITE

Prepared by

Gannett Fleming Environmental Engineers, Inc.

April 1988

GFEE Project Manager _____

GFEE Quality Assurance Manager _____

EPA Region III Project Manager _____

TABLE OF CONTENTS

Quality Assurance Project Plan Distribution List

GFEE Project Manager	Anton Miorin
GFEE Quality Assurance Manager	David Lane
U.S. Testing Company, Inc. QA/QC Officer	Jane Dunn
EPA Region III Project Manager	Michael Towle

1.0 Project Description

A general description of the Butler Mine Tunnel project can be found in the Introduction to the Phase II Remedial Investigation Work Plan. This Quality Assurance Project Plan describes the quality assurance (QA) policies and procedures that will be used by GFEE. The analytical laboratory will have the responsibility for maintaining QA procedures in performing the requested analyses.

The groundwater to be sampled at the Butler Mine Tunnel site is the water that infiltrates into the abandoned underground mine workings. This groundwater can enter the Tunnel and discharge to the Susquehanna River. The groundwater will be collected from the exploratory boreholes and the Tunnel discharge. Procedures for the sampling of this groundwater are found in the Sampling Plan located in Appendix C.

2.0 Project Organization and Responsibility

The Gannett Fleming Project Manager will have final responsibility for the technical aspects of all work on this project including quality assurance. The Project Manager will be assisted in performing QA/QC functions by a Quality Assurance Manager (QAM). Depending upon the diversity of types of data and measurements to be obtained, evaluations to be performed and documents to be produced, Quality Assurance Coordinators (QAC) may also be assigned. Each QAC will have responsibility for maintaining quality control for certain categories of data or project output. Gannett Fleming's QAM for this project reports directly to the Project Manager.

The key personnel responsible for Gannett Fleming's activities relating to the Butler Mine Tunnel Project are listed below:

Project Manager	Anton F. Miorin
Health and Safety Officer	Robin Pepperman
Field Team Coordinator	Joseph Saliunas
Quality Assurance Manager	David Lane

Gannett Fleming personnel can be reached at Gannett Fleming, P.O. Box 1963, Harrisburg, Pennsylvania 17105 and (717) 763-7211.

The laboratory analysis for the water and chemical sediment samples will be performed by the Chemical Services Division of the United States Testing Company, Inc. (US Testing). This division of US Testing is an EPA Contract Laboratory.

The benthic macroinvertebrate sampling will be done by RMC Environmental Services. RMC's project responsibilities will be managed by William S. Ettinger, a Senior Ecologist with over 13 years of experience in environmental impact assessments. He will be assisted by Charles Denoncourt and George Christian.

Resumes for key personnel for Gannett Fleming, US Testing and RMC can be found in Attachment A. An organizational chart for US Testing is also presented in Attachment A.

3.0 Quality Assurance Objectives in Terms of Precision, Accuracy, Completeness, Representativeness and Comparability

Maintenance of a consistently high degree of quality in all aspects of the contract activities is the general objective of this Quality Assurance Project Plan. In the case of all project information other than measurement data, the specific objectives are acceptable accuracy and completeness. These objectives will be achieved by assigning qualified personnel to perform technical tasks and by implementing a chain of technical review that begins with peer review by technical support staff and culminates with detailed review by the project manager. The QAM will coordinate and track the review process. The technical review process will ensure that all text and graphics comprising project deliverables are complete, technically accurate, are in compliance with the established scope of work, and incorporate sound professional judgment.

In the case of measurement data, the specific quality assurance objectives are satisfactory precision, accuracy, completeness, representativeness, and comparability. For each field or laboratory measurement parameter, EPA Contract Laboratory Project (CLP) quality assurance criteria will be utilized. In the case of approved laboratory methods and certain field instruments, precision and accuracy data are available. Such data would define the minimum acceptable precision and accuracy for the performance of this project. Precision and accuracy can only be quantitatively discussed within the context of specific data and measurement methods. However, the following general QA procedures will be followed.

Precision

The precision of measurements made for each project will be (a) evaluated and reported along with a developed method; (b) the highest

attainable through the use of high purity materials, knowledgeable personnel, and latest procedures consistent with good scientific practice and will further be ensured by internal quality control; and (c) consistent with any previously published precision data from the applicable literature and/or federal regulations and guidelines. A mechanism for demonstrating the precision (reproducibility) of each measurement process will be established.

Precision is generally checked by analyzing replicate samples or by operating multiple monitoring devices in a single location. From these data, control charts are prepared on which upper and lower control limits are set. Acceptable precision is demonstrated when all measurements for replicate samples are within the control limits. Instrument checks are crucial to achieving optimal precision. Instruments will be checked and calibrated during each use (in-process calibration) and on a routine basis (maintenance calibration). Calibration procedures are covered in greater detail in a later subsection.

Accuracy

Accuracy, the relationship of the reported data to that of the true value(s) will be (a) reported with the data; (b) attained by independent audits using standards which are different from those used during routine operations, and (c) consistent with previously published accuracy data from the applicable literature, and federal regulations and guidelines.

Completeness

Data obtained must be sufficient to provide a sound statistical basis for decision making. QA in terms of completeness will be developed for each data collection task in a work assignment. Each data base developed for purposes of this project will meet completeness criteria sufficient to

substantiate the conclusion or decision made. Completeness criteria will be a function of data base type and may differ significantly, for example, between a data base supporting a cost effectiveness analysis and one that supports a human toxicological risk/exposure assessment.

For relatively clean, homogeneous matrices, the laboratory expects 100 percent completeness. As matrix complexity and heterogeneity of the sample increases, completeness may decrease. Any instances where a sample cannot be analyzed or where data quality objectives are compromised will be reported by the laboratory.

Representativeness

All data must be representative of the media, method, or parameters evaluated during the performance of this project. Sampling and measurement systems will be designed to be responsive to changing media conditions and assure representativeness to the extent feasible. Representativeness will be assessed through measurement system audits.

Several elements throughout the sampling and sample handling process must be controlled to maximize the representativeness of analytical data. These include sample collection, sample preservation, and the time lapse between sampling and analysis. Sampling procedures are described in the Sampling Plan. To assure that sample aliquots taken for analysis are representative, samples will be homogenized by removing any non-representative materials (e.g., sticks or stones), then stirring, shaking, crushing, and/or blending the sample as appropriate to the matrix.

Comparability

To prove comparability, all data will be reported (a) in units consistent with both Federal regulations, methods, and guidelines, and (b) in units comparable with previously published work with similar methods within the same media. Comparability between data bases will also be achieved by standardized siting, sampling, analysis and data formats.

The comparability of the data will be maximized by the use of approved, standardized CLP protocols for metals, cyanide, and organic compounds whenever they are available. Oil analysis will be performed according to EPA-approved methodology.

4.0 Sampling Procedures

The sampling procedures and information on sample site selection, sampling equipment, sample containers, preservation and handling of samples, field chain of custody procedures, and quality control checks can be found in the Sampling Plan. Laboratory chain of custody, sample container labeling procedures, and sample transport information are presented in Attachment A.

The complexity of the abandoned underground mine workings makes the utility of any subterranean detection device for siting the boreholes questionable. The boreholes are to descend approximately 200 to 300 feet deep through previously mined coal veins that may or may not be in a collapsed state.

The Sampling Plan provides guidance for the field work but is limited by the fact that in many cases field conditions need to be evaluated prior to sampling equipment and sampling procedure selection.

Sampling analysis will not be limited to oil and the consent order contaminants. Various samples will also be analyzed for the HSL constituents and oil. Details on the sampling and analysis to be performed can be found in the Sampling Plan.

The Gannett Fleming Project Manager will plan site activities with the assistance of the Field Team Coordinator and other Gannett Fleming personnel. The Project Manager will be responsible for approval of site activity plans.

5.0 Sample Custody

Control and documentation of sample custody is critical to assuring sample integrity. The QAM will be responsible for implementing and enforcing chain of custody control in all cases where samples are procured. Chain of custody procedures will be followed in the field, during transport, and in the laboratory. The figure which follows this page is a schematic diagram of the movement of sample and analytical data from sample collection through issuance of a report.

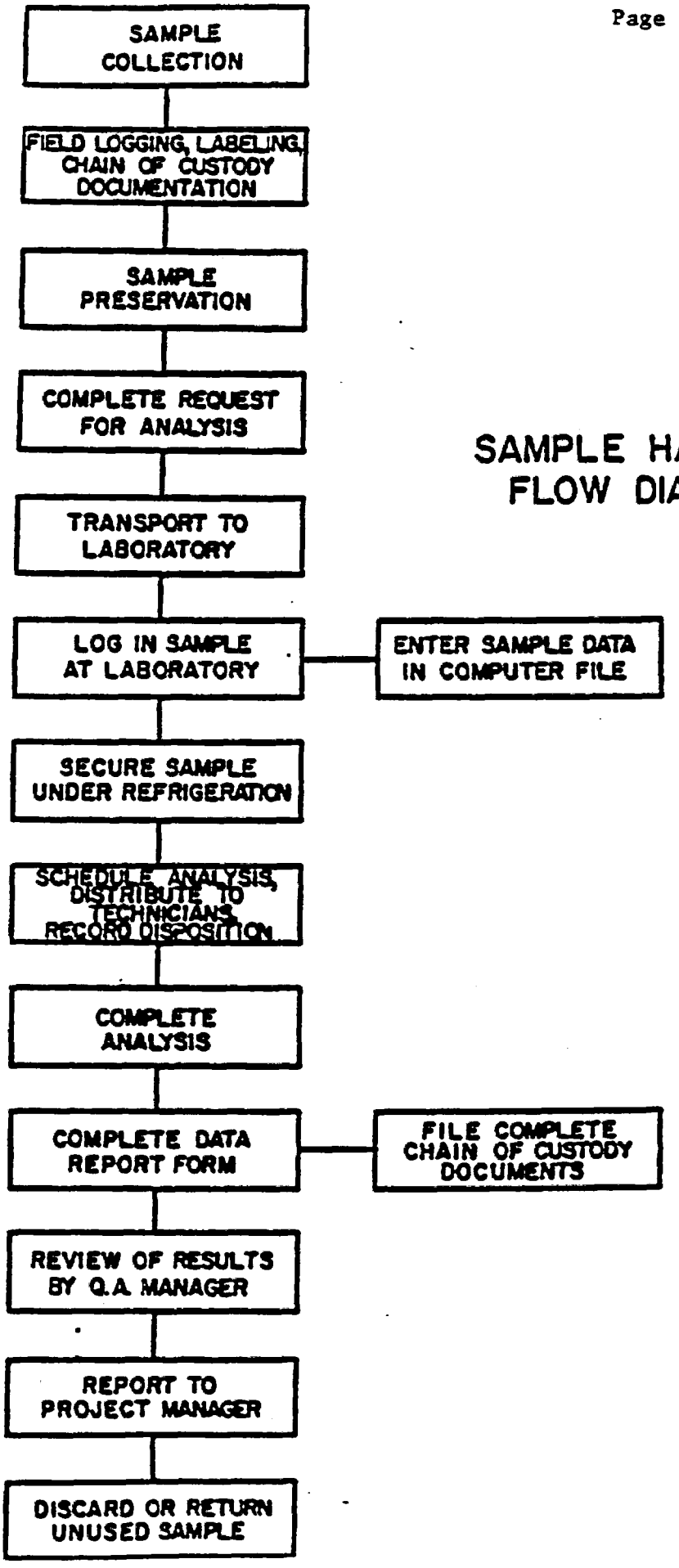
Field Custody Procedures

The chain-of-custody form is used to track the control of the sample from the time of sample collection to the delivery of samples to the laboratory. The chain-of-custody procedures to be used for handling of samples can be found in the Sampling Plan. The chain-of-custody form is obtained from the laboratory and is taken to the sampling site with the appropriate sample bottles. One chain-of-custody form is used for each sample shipment. The sampler will sign and date the first "received" blank space upon receipt of the cooler and sample bottles, and sign and date the next "relinquished" blank space upon return of the samples to the laboratory.

Sample labeling and chain-of-custody procedures including a chain-of-custody form are presented in Attachment B. These procedures include transport procedures and are established by US Testing.

Sample bottles, transport containers, and preservation chemicals will be supplied by the laboratory.

SAMPLE HANDLING FLOW DIAGRAM



Laboratory Custody Procedures

Upon receipt of samples in custody, the package will be inspected and any damage to the sealing tape or other special custody seals will be noted. If no tampering or damage has occurred, the package is opened and the presence of each item listed on the sheet is verified and correctly identified by the laboratory supervisor. If all data and samples are correct, the "received by laboratory" box is signed and dated. In the event errors are noted, the discrepancies are recorded in the remarks column before signing the chain-of-custody record.

The following general guidelines will be used by the laboratory supervisor or his designated assistant in maintaining the chain-of-custody in the laboratory.

- The samples received by the laboratory will be crosschecked to verify that the information on the sample labels matches that on the chain-of-custody record included with the shipment.

- The completed Request for Analysis Form will be used to log in the sample and define the parameters that are to be determined. It is also used to enter pertinent data in the laboratory computer. Adjustments in the scheduling of analyses will be made according to project needs and approval by the laboratory supervisor and project manager. Sample aliquots will be distributed to the appropriate analysts, with names of individuals who receive samples to be recorded in the internal laboratory records. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the requested analysis has been performed and required documentation is complete.

- When field-sample testing and quality assurance checks have been completed, the unused portion of the sample may be disposed. All identifying labels, data sheets and laboratory records will be retained as part of the permanent documentation.

6.0 Calibration Procedures and Frequency

The calibration procedures described in this section will apply to all field and laboratory instruments, and measuring equipment utilized in pollutant measurement systems. The laboratory and field QACs will be responsible for ensuring that the calibration procedures are continuously in force. Calibration status will be continuously monitored. In all cases, the laboratory calibration procedures used will be developed according to CLP protocol.

Procedures for Instrumental and Analytical Quality Control for the laboratory equipment are presented in Attachment B. These procedures will be used to insure that the laboratory equipment is functioning optimally. The selection of field measuring equipment from the available models will be based on the site conditions. Manufacturer's instructions for calibration, operation and maintenance will be followed.

A log of Calibration and Maintenance for each instrument will be kept with each instrument. The calibration and maintenance record will be detailed therein. In addition, a calibration status tag will be affixed to each instrument to advise operators of current calibration conditions. When recalibration is performed, a new tag will be filled out and affixed to the instrument.

A written calibration procedure will be available for each piece of test and measurement equipment. This procedure is documented in the form of an instrument-specific checklist. Any instrument which is not calibrated to within the manufacturer's original specifications must display a red warning tag to alert the user that the device carries only a "limited calibration."

Calibration of analytical instruments will be performed daily when instruments are in use or more frequently if warranted by the analytical method. Instruments which are past due for calibration shall be immediately removed from service either physically or, if this is not practical, by tagging, sealing, labelling, or other means.

In-Process Calibration

In addition to the calibration normally required subsequent to equipment maintenance and repair, a calibration more commonly performed (for confirmation of equipment integrity) is an in-process instrument calibration associated with many analytical procedures. Pursuant to this latter type of calibration, it would be impractical to post a separate file entry for each of these applications; however, a record of such calibration will be kept in the associated laboratory work notebooks. A minimum of a blank and four standards will be used for the production of a calibration curve. Calibration curves will be checked at least daily with freshly prepared standards when an instrument is being routinely used. Also a calibration standard will be run as an instrument check as determined to be necessary. The calibration procedures described above will in addition apply to all safety and health monitoring instruments.

Source and Traceability of Calibration Standards
(TCL Organics, Metals, Cyanide, Oil/Grease)

The laboratory receives calibration standards from the EPA and also purchases standards from Aldridge and Supelco in Bellefonte, Pennsylvania. Currently all standards for GC, GC/MS, Pesticide/PCB's and the Extraction laboratory are purchased from the above. The laboratory Standard Operating Procedure (SOP) for Instrumental and Analytical Quality Control found in Attachment B, requires that standards be run against each other in approximately a one out of 10 ratio received. The laboratory is currently working with EPA in establishing an SOP for traceability of standards.

7.0 Analytical Procedures

With regard to laboratory procedures for analysis of environmental samples, EPA approved methods generally define the accepted standard of practice. All analyses will be performed according to CLP protocol. The principle references used for analytical procedures and QC criteria are found in Attachment B.

In cases where it is necessary to modify standard analytical methods, or to develop new ones, accuracy and precision will be verified. Such methods will be reviewed with EPA and employed for sample analysis only after approval by the Agency. All analyses will be performed by qualified technicians with experience in the specific techniques required. Qualifications of laboratory personnel assigned to work under this project will be subject to review and approval by the QAM.

Procedures and Standards for QA procedures for non-target compounds such as oil/grease, TOC, TSS, etc., are supplied to the laboratory by the US EPA Environmental Monitoring and Support Laboratory in Cincinnati. A typical document (Method 413.1 and 413.2 for oil and grease analysis) can be found in Attachment B.

8.0 Data Reduction, Validation, and Reporting

A plan for data reduction, validation, and reporting will be prepared for each work assignment. The plan will include the data reduction scheme based on the anticipated array of data, format for data recording and computer storage, criteria to be used in validating data integrity, statistical criteria to be used to identify outliers, quality assurance chain of review, and final documentation and reporting scheme. The objectives of the data handling plan will be to ensure data is collected, analyzed, and reported in accordance with the needs of the work assignment and that all manipulations of data, manual or automated, are fully subjected to all appropriate quality assurance reviews and approvals. Data obtained in the field, including observations and notes, will be permanently entered in bound notebooks subject to review by the QAC and appropriate technical team leaders. In certain cases, these data will be loaded into computer systems for reduction and processing. The data and computer reduction schemes will be approved by the QAM after discussion with involved technical team members. Example calculations and computer programs used for data reduction and analysis will be retained on record and referenced as to the data set for which they have been used.

In the case of laboratory data, established data handling procedures will be followed. These procedures will incorporate and interface with Internal Quality Control Checks (next section) and are summarized as follows.

Data Reduction

The calculation of final results from raw data varies from parameter to parameter, concentration units and equations, and procedures for calculating concentrations are spelled out in the CLP procedures.

The procedures for blanks and other QC samples are presented in Attachment B. Blank Method Summary Forms will be completed as required.

Data Logging

On receipt of samples for analysis accompanied by a completed request for analysis form detailing the analytical parameters, the laboratory supervisor or his delegate will:

- Log in samples, assign log numbers, and attach the numbers to the sample container(s);
- Assign priority and hazard rating numbers;
- Prepare a Data Summary Sheet noting thereon the analytical parameters with spaces for resulting analytical data; and
- Assign the samples a position in the laboratory work load backlog.

Analyzing the Sample and Reporting of Analytical Results

The samples will be analyzed by the chemists or technicians using approved analytical procedures. The chemist/technician will record the results of analyses on the Data Summary Sheet for the sample in question. The completed sample Data Summary will be sent to the laboratory supervisor and QAC for review.

Validation of Data

The laboratory QAC will check the data summaries for:

- Completeness of analytical data;
- Correctness of analysis units and, if unit conversions were required, the accuracy of such conversions;
- Conformance with internal laboratory quality control checks;
- Appropriate significant figures of data; and
- Credibility of analytical data based on past experience with similar samples.

Storage of Analytical Data

Current analytical data will be retained in the laboratory files and on the computer disks for a minimum of three years. After three years, the disposition of these data will be determined as set forth in the Data Management Plan in Appendix E.

A summary of the information that will be reported is presented in the Document Control SOP, which is presented in Attachment B.

9.0 Internal Quality Control Checks and Frequency

Multiple internal quality control checks exist in the management of projects by Gannett Fleming. Internal quality control checks for the laboratory will be developed according to CLP protocol. Before any project deliverable is submitted to the EPA project officer, it will have passed through a series of technical, quality assurance, and management reviews.

The Gannett Fleming management and technical organizational structure will provide quality control checks for all project activities. The environmental engineering company (GFEE, Inc.) is subdivided into sections with each section head responsible for assigning technically qualified staff according to the needs of the project manager. The section head is further responsible for maintaining staff capability, professional standards, and quality control. He or his delegated representative will personally review all project outputs in his technical area for accuracy, completeness, and professional standards. Quality assurance problems will be immediately reviewed with technical team leaders and rectified. The QAM will require section head approval on all project materials before he performs final quality assurance review and recommends acceptance to the project manager. The technical organization provides internal quality control checks at several levels; QAC for specialized activity (e.g. field, laboratory), technical team leader, section head, QAM, and project manager. In addition, special services such as drafting, computer programming, and word processing maintain quality control protocols within their respective departments.

10.0 Performance and System Audits

Independent assessments of technical programs subject to quality assurance will be periodically conducted. Audits will be the responsibility of the QA staff and will involve the use of personnel and equipment not involved in routine operations within the scope of this project. They will be designed to monitor quality assurance procedures in order to detect and correct conditions that could result in loss of data or deficient quality. Audits will be conducted quarterly, and more frequently if required by the project manager. The types of audits to be conducted during the performance of this project include:

- Technical Review Audits;
- Field Measurement Audits;
- Automatic Data Processing Audits;
- Laboratory Audits;
- Instrument Audits; and
- Document Control Audits.

These audits will form the basis for a permanent record of conformance of project activities to quality assurance requirements.

Technical Review Audits

The QA staff will document adherence to the quality assurance chain of review procedure for all project deliverables such as studies, progress reports, and designs. Records of sign off and approvals for all work assignment products by qualified individuals approved by the QAM will be checked for completeness.

Field Measurement Audits

Field measurement equipment and data logging procedures will be audited to check quality assurance regarding operation of measurement systems, calibration methods and frequency, training and qualifications of field personnel, adherence to established standard operating procedures, sample chain of custody procedures, and field data logging. For each work assignment, a field measurement audit form will be prepared by the quality assurance staff. This form will ensure that the above listed areas are adequately covered by the audit team.

Automatic Data Processing (ADP) Audits

The routine auditing of ADP procedures and systems will confirm acceptable quality assurance in the performance of all work tasks in which computer systems and personnel are involved. Conformance to the established programming chain of review will be checked. The quality assurance procedure for providing accuracy in the input of data from field and laboratory notes to the data processing systems will be audited for thoroughness and effectiveness. The permanent quality assurance protocol and staff within the ADP department will be reviewed.

Laboratory Audits

At the beginning of each work assignment, the contract laboratory will be required to submit quality assurance plans to the QAM. The audit team will periodically inspect and review quality assurance procedures. These audits will include checking of laboratory records documenting quality control procedures, such as preparation and dating of standard curves and quality control charts, instrument calibration, sample logging and chain of custody, ADP procedures, and review of results before reporting out. At the discretion of the QAM, unknowns may be submitted to a laboratory for analysis as part of the auditing procedure.

Instrument Audits

Instrument audits will be performed in order to evaluate the performance of selected instruments or multi-instrument systems. The evaluation process will include both a quantitative assessment of selected performance specifications such as precision, sensitivity, down time, and qualitative review of all documentation critical to proper operation of the instrument (e.g., operating procedures, maintenance procedures and adequate laboratory logbooks).

The assessment of instrument performance will be conducted on-site, utilizing calibration standards for specific methods. The auditor will also evaluate the results in terms of existing QC charts for the instrument.

Standards used in the calibration of anaytical instruments will be evaluated in terms of the validity of their concentration, their traceability to standards of higher authority, shelf life, storage, observable deterioration, and adherence to standard preparation protocols.

Document Control Audits

A quality assurance audit will be periodically conducted to verify that all established document control procedures are continuously in effect. The audit will evaluate adherence to predetermined indexing, filing, distribution, confidentiality, and security procedures. Special procedures that have been implemented to protect evidentiary data and documents will be inspected for conformity to the quality assurance program.

An audit plan will be developed to provide the basis for each audit. The audit team will be selected on the basis of technical expertise and auditing experience. All auditors will be independent of the activities audited.

Upon completion of each audit, an audit report will be prepared and submitted to the QAM. Any corrective actions required will be indicated. The QAM will establish a schedule for implementation of corrective actions and inform the project manager. The audit team will verify the implementation of corrective actions and document such actions in written memoranda to the QAM and project manager.

11.0 Preventive Maintenance

The project team will establish preventive maintenance schedules and spare parts inventories for safety equipment, field sampling equipment, computer hardware, and vehicles. The laboratory will follow the preventive maintenance procedures presented in Attachment B. A list of critical spare parts is also presented in Attachment B.

Preventive maintenance is recognized as critical to maintaining required accuracy and reliability of all equipment used in hazardous waste activities. The key elements in the preventive maintenance program are controlled storage, use limited to qualified personnel, inspections, immediate repair, and availability of spare parts and back-up units. In the case of field instrumentation, preventive maintenance schedules are tied in with calibration procedures and frequency. Service contracts are in force with instrument manufacturers for those instruments for which a comprehensive spare parts inventory is not considered practical and/or required level of expertise to perform maintenance and repairs is not available in-house. The laboratory QAC is responsible for identifying such service contract needs and ensuring they are continuously in effect. Computer hardware systems are covered under manufacturers' service contracts subject to that department's management control.

Throughout the performance of this project, maintenance records will be filed and readily available for inspection by the QAM and quality assurance auditors. Preventive maintenance intervals will be adjusted to reflect experience with equipment performance during the project. All field analytical equipment will be tested in the laboratory before dispatch to the site, and will be cleaned, tested, and overhauled if necessary after removal from the site. Care and storage of all equipment will be designed to prevent damage and deterioration.

12.0 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

The specific procedures used to assess precision, accuracy, and completeness will depend on the type and quantity of data to be collected for a work assignment. Routine procedures are most applicable to quantitative data, such as laboratory analyses. Examples of routine procedures used to assess precision and accuracy of laboratory results are as follows.

- o Accuracy
  - Analysis of reference samples (spiked or obtained from an approved supplier);
  - Analysis of unknowns as part of laboratory quality assurance audit; and
  - Participation in interlaboratory "proficiency in analytical testing" (PAT) rounds.
- o Precision

  Analysis of replicate samples; and

  Continuous maintenance of quality control charts.

Statistical methods to be used in assessing laboratory and field data are discussed in detail in the following references.

1. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," U.S. EPA-EMSL, Cincinnati, Ohio, EPA-600/4-79-019, March 1979.

2. "Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples," EPA-600/1-79-008, January 1979.

3. "Handbook for Analytical Control in Radioanalytical Laboratories," EPA-600/7-77-088, August 1977.

4. Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supplies - Criteria and Procedures," EPA-600/8-78-008, August 1978.

5. "Quality Assurance for Radiological Monitoring Programs (Normal Operations) Effluent Streams and the Environment," U.S. Nuclear Regulatory Commission, Regulatory Guide 4.15, Revision 1, February 1979.

6. "Quality Assurance Handbook for Air Pollution Measurement Systems. Volume I - Principles," EPA/600/9-76-005, March 1976.

7. "Quality Assurance Handbook for Air Pollution Measurement System. Volume III - Stationary Source Specific Methods," EPA-600/4-77-0276, August 1977.

8. Industrial Hygiene Laboratory Quality Control - (Manual 587)," Division of Training and Manpower Development, NIOSH, Cincinnati, January, 1980. U.S. Gcvernment Printing Office 1980/657-147/5842, P.O. H1387.

9. "Quality Control Manual," Analytical Committee of American Industrial Hygiene Association, Akron, Ohio, 1980.

Completeness of data will be assessed during the course of each work assignment by comparing the amount of a type of data collected with that which has been defined as necessary to characterize the system and make sound conclusions. In some cases, quantitative statistical methods will be used to ssess the completeness of data sets. Central tendency and dispersion tests, for example, may indicate the advisability of obtaining additional data. It

will be the responsibility of the QAM to determine whether the completeness objective for a particular work assignment is being met or if additional data must be obtained.

For non-measurement data, accuracy and completeness will be assessed through the management chain of review described earlier in this quality assurance program. The review process will ensure that technical decisions are based on all available relevant data.

13.0 Corrective Action

Quality control violations or deviations from the quality assurance program will trigger the need for corrective action. GFEE and the analytical laboratory, respectively, will be responsible for undertaking corrective actions on owned and leased equipment. Laboratory corrective action will be in accordance with CLP protocol.

Corrective action for certain types of problems such as instrument drift or minor performance interruptions will be immediately responded to by the technical personnel involved in accordance with the quality assurance guidelines governing their activity. Such corrective actions will be recorded and included in the regular quality assurance audits. Quality assurance problems requiring more extensive response, including decision making and the preparation of a corrective action plan, will be immediately brought to the attention of the QAM when discoverrd by technical personnel, team leaders, QAC, or the auditing staff. The QAM will report the problem to the project manager and will meet with the appropriate technical personnel to define the limits of the problem and develop a corrective action plan. The mechanism defined in this plan will be implemented as expeditiously as possible. If necessary, contingency actions such as preservation of samples, re-sampling, or use of a second laboratory will be taken pending completion and acceptance of corrective actions. When corrective actions have been completed, quality control testing will be supervised by the QAM who will in turn report to the project manager when satisfactory system performance has been re-established.

14.0 Quality Assurance Reports

The QAM will be responsible for setting a reporting schedule for the QACs and submitting the summary quality assurance report to the project manager. Reports will be submitted with the regular quality assurance audit reports discussed in Section 10. These reports will include:

- Assessment of measurement data accuracy, precision and completeness;
- Results of quality assurance audits;
- Laboratory performance evaluations;
- Summary of corrective actions that have been taken;
- Status and effectiveness of technical review procedures; and
- Recommendations for any modifications to the quality.

Required corrective actions will be reported immediately upon their discovery.

SECTION A
REVISION NO. 0
DATE: April 1, 1988

ATTACHMENT A

Personnel Resumes

GANNETT FLEMING ENVIRONMENTAL ENGINEERS

Personnel Resumes

GANNETT FLEMING

BIOGRAPHICAL SKETCH

ANTON F. MIORIN

TECHNICAL SPECIALTIES: Hazardous Materials Engineering
Pollution Control Technology

EDUCATION: B.S., 1952, Civil Engineering, Manhattan College
M.S., 1954, Sanitary Engineering, University of Michigan

REGISTRATION: Professional Engineer: Pennsylvania

PROFESSIONAL AFFILIATIONS: Water Pollution Control Federation
Water Pollution Control Association of Pennsylvania
American Society of Civil Engineers

EXPERIENCE: Mr. Miorin serves as Project Manager for a variety of hazardous materials and industrial wastewater projects. In this capacity, he supervises and coordinates collection and interpretation of data, preparation of preliminary designs and cost estimates, preparation of construction drawings and specifications, bid analysis, construction inspection and initial facility startup and operation.

His recent project experience includes:

- Design and installation of impervious caps for three lagoons containing electroplating sludges and chlorinated sludges.
- Design of an ambient air, work station, soil, and ground and surface water PCB sampling program, and subsequent preparation of specifications for removal and disposal of contaminated soil.
- Fast-track preparation of basis of design, and drawings and specifications for construction of an industrial wastewater treatment plant for an electronics equipment manufacturer.
- Preparation of a basis of design, drawings and specifications for construction, operation and closure of a lined landfill for disposal of electric arc furnace dust; preparation of a design, drawings and specifications for construction, operation and closure of a facility to stabilize electric arc furnace dust; preparation of a waste pile closure plan, drawings and specifications, and post-closure maintenance and groundwater monitoring plan, all for a primary metals manufacturer.

GANNETT FLEMING

BIOGRAPHICAL SKETCH
ANTON F. MIORIN

EXPERIENCE:

- Preparation of soil, ground and surface water sampling plan for abandoned battery reclamation facility to determine extent of contamination; preparation of drawings and specifications for removal and disposal of contaminated soil; and design of ongoing ground water monitoring plan.

As Project Manager for preparation of a comprehensive water quality master plan for the central Susquehanna River basin, Mr. Miorin was responsible for the six year, two million dollar effort that required management of 12 major professional disciplines: 24 full-time employees (7 furnished by a subconsultant); 8 subconsultants; 20 work phases and 255 tasks, each phase and task with its own budget and schedule. These factors caused Mr. Miorin to develop computer based innovative progress, budget, and schedule monitoring systems that provided him with current data that was necessary to make timely project management decisions that supported compliance with schedule and budget.

Mr. Miorin is Project Manager for the Butler Tunnel Superfund site technical activities being performed by a PRP group. This private lead project will incorporate RI/FS, RD, and RA under consent agreement with U.S. EPA Region III. To date, he has managed preparation of a Phase I RI based on the record of past response and enforcement activities. The work plan for second phase RI and FS is a matter of current discussion with U.S. EPA.

Prior to joining Gannett Fleming, Mr. Miorin served in the U.S. Air Force as Sanitary Officer and Industrial Hygiene Engineer. In that capacity, he was responsible for monitoring base industrial environmental (air/noise), sanitary landfill operations, groundwater supply quality investigations, and hazardous and radioactive materials handling programs.

BDRAM002

GANNETT FLEMING

BIOGRAPHICAL SKETCH

ROBIN L. PEPPERMAN

TECHNICAL SPECIALTIES:
Industrial Hygiene
Safety Surveys
Water Chemistry

EDUCATION:
B.S., 1983, Environmental Health, West Chester University
Graduate Studies, 1986, Safety Science, Indiana University of Pennsylvania

PROFESSIONAL AFFILIATIONS:
American Industrial Hygiene Association, National and Central Pennsylvania Section

EXPERIENCE:
Ms. Pepperman has conducted comprehensive industrial hygiene and safety surveys for small and large industries in accordance with federal, state, and/or local regulations. These surveys included the identification of hazards, sampling, and analysis of data, as well as recommendations to improve health and safety conditions and to reduce employee exposure to hazards. She has instructed employees in proper safety procedures and in proper methods for performing follow-up inspections.

Ms. Pepperman recently completed an EPA approved course called Health Safety Training for Hazardous Waste Sites. This course covered appropriate techniques for inspection and sampling (air, waste, soil) of sites containing hazardous substances/wastes.

She has assisted school districts and private-sector clients in their efforts to abate asbestos contamination by: monitoring asbestos, bulk and air sampling, development of engineering controls, preparation of specifications and drawings, cost estimation, and monitoring removal contractors' work to ensure compliance with applicable regulatory requirements. She also instructed and monitored employees involved in the removal of asbestos, including respirator fitting, removal instructions, and personal hygiene.

She is currently monitoring implementation of the Environmental Health and Safety Plan at the S-Area Superfund Site in Niagara Falls, New York, for U.S. EPA as a member of Gannett Fleming's project team. Her duties include the review of all environmental health and safety protocols submitted by the site owner to determine compliance with settlement agreement documents; federal, state, and local regulation compliance; and good industrial hygiene practices. Her duties include evaluation of the following plan elements: medical examinations; personal

BIOGRAPHICAL SKETCH
ROBIN L. PEPPERMAN

EXPERIENCE:

equipment, clothing, hygiene, and safety; worker and community air monitoring; vapor emission response; dust suppression; security; material access and removal; general safety; confined space activity; communications; and utility considerations.

Ms. Pepperman has completed and is responsible for implementation of the Environmental Health Plan for the Folcroft Landfill/Tinicum Marsh EIS/RIFS. This project includes both surface and subsurface investigation.

She also supervises the development and implementation of Federal and Pennsylvania Community and Worker Right-to-Know studies.

Ms. Pepperman has attended the National Asbestos Training Center/University of Kansas Inspection/Management training course that is necessary for accreditation under EPA AHERA regulations.

BDRRP003

GANNETT FLEMING

BIOGRAPHICAL SKETCH

JOSEPH R. SALIUNAS

TECHNICAL SPECIALTIES: Mining Engineering
Sanitary Engineering

EDUCATION: 1946-1950, School of Engineering, Johns Hopkins University
1954-1961, Schools of Engineering and Industrial Administration, Carnegie-Mellon University

PROFESSIONAL AFFILIATIONS: Water Pollution Control Federation

EXPERIENCE: Mr. Saliunas is responsible for the evaluation of environmental problems associated with active and abandoned surface and underground mines. These responsibilities include planning, collecting, and checking necessary data to develop stream and mine discharge flow and quality estimates; developing and evaluating various pollution abatement measures; and preparing engineering reports.

As Project Engineer, Mr. Saliunas prepared a feasibility study for the Indiana Department of Natural Resources that led to preparation of plans and specifications for reclaiming 92 acres of coal refuse disposal sites and upgrading the stability of a dam forming a 120-acre impoundment. He prepared drilling plans and assisted in direct inspection of drilling for geotechnical information for both the dam and coal refuse areas.

For the Pennsylvania Department of Mines and Mineral Industries, he performed watershed investigations in the 170 square mile Beech Creek Watershed in Centre and Clinton Counties. The extent of past surface and underground mining as well as the locations, flows, and qualities of mine drainage discharges and current stream qualities were determined. Alternative preventive and treatment measures were evaluated.

For the Maryland Department of Natural Resources he performed a study setting forth recommended plans for abatement of mine drainage pollution in a 108 square mile area of western Maryland. Investigations were made in three drainage areas to determine the extent of mining, locations, flows, and qualities of mine drainage discharges, and flows and qualities of streams draining the area. Alternative applicable preventive and treatment measures were evaluated. The recommended plans would handle 39 mgd of mine drainage containing 19 tons/day of acid and 2 tons/day of iron.

BIOGRAPHICAL SKETCH
JOSEPH R. SALIUNAS

EXPERIENCE:

For the Pennsylvania Department of Environmental Resources, he helped to prepare a report summarizing watershed investigations in a 19 square mile area of the Swatara Creek Watershed. The extent of past mining as well as locations, flows, and qualities of mine drainage discharges and stream flow qualities were determined. Alternative preventive and treatment measures were evaluated.

He assisted in preparation of an engineering study for the Glen Alden Coal Corporation in Ashley, Pennsylvania, setting forth capital and annual costs to pump and chemically neutralize 19 sources of acid mine drainage from active and abandoned deep mine operations in Pennsylvania's Anthracite Fields.

Mr. Saliunas, under an annual consulting agreement with the Maryland Department of Natural Resources, assisted in providing services connected with past, present, and proposed coal mining. Typical services included evaluation of proposed mining plans, geologic investigation of landslides attributed to mine drainage, detailed plans and specifications to alleviate a strip mine spoil landslide, and potential damage from a breakout of mine water impounded in an abandoned deep mine.

For the Pennsylvania Department of Health, he helped to perform investigations on plans for eliminating the Duryea and Old Forge mine drainage discharges. These discharges were major overflows from a portion of the Northern Anthracite Field and caused severe pollution of the Lackawanna River and the North Branch of the Susquehanna River - 115 mgd of acid mine drainage containing 132 tons/day of acid and 62 tons/day of iron.

For Pennsylvania Department of Environmental Resources, he prepared a study on plans to prevent acid mine drainage pollution of the North Branch of the Susquehanna River from overflows from the Wyoming Valley Mine Water Pool in the Northern Anthracite Field. Proposed collection and treatment facilities would handle 57 mgd containing 94 tons/day of acid and 53 tons/day of iron.

He assisted in inspection of drilling for various dam improvement projects, including the Chester Water Authority, Mahanoy Township Authority, and Latrobe Water Company.

GANNETT FLEMING

BIOGRAPHICAL SKETCH
JOSEPH R. SALIUNAS

EXPERIENCE:

He has prepared drilling plans for overburden analysis for coal strip-mine operations in northcentral Pennsylvania.

For U.S. EPA and the Pennsylvania Department of Environmental Resources, he was involved in a comprehensive research and development investigation of the feasibility of sealing three water level rock tunnels providing gravity mine drainage from the South Green Mountain Basin in the Pennsylvania anthracite coal fields. This work included extensive geological investigations, preparation of construction plans and technical specifications for stream reconstruction and tunnel sealing, supervision of construction, and evaluation of the effectiveness of work undertaken in abating acid mine drainage.

Also for U.S. EPA and the Pennsylvania Department of Environmental Resources he participated in a research and development demonstration project in the Tioga River Basin to determine the effectiveness of restoring strip mines, reconstructing stream channels, and using wastewater sludge as a soil conditioner on restored strip mines. Affected streams and mine drainage discharges were monitored before and after construction to determine the effectiveness of the work.

BDRJS009

GANNETT FLEMING

BIOGRAPHICAL SKETCH

DAVID W. LANE

TECHNICAL SPECIALTIES: Analytical Chemistry
Environmental Surveys

EDUCATION: B.S., 1972, Chemistry, Edinboro State University

PROFESSIONAL AFFILIATIONS: Water Pollution Control Federation

EXPERIENCE: Mr. Lane has provided extensive analytical services and consultation for private and industrial clients, as well as governmental agencies. These services include monitoring of wastewater effluents, preparation of NPDES and mine drainage permits, evaluation of polymer bed water treatment systems, water quality testing of streams, pilot studies for wastewater treatment systems, water leachate analyses on soil and sediment, and hazardous waste determinations. He has also interpreted laboratory data in order to design and evaluate waste treatment facilities and to trace toxic materials in groundwater. He is experienced in the operation of the laboratory equipment needed to perform these services, including gas chromatograph, atomic absorption spectrophotometer, total organic carbon analyzers, total sulfur analyzer, and gas chromatograph/mass spectrophotometer.

Mr. Lane is presently involved in two major environmental projects for U.S. EPA Region III. For the Environmental Assessment of strip mine reclamation using municipal wastewater treatment plant sludge, he has directed the analysis of soil, vegetation, soil percolate water and groundwater from 11 reclaimed strip mines and control sites in Western Pennsylvania. He has also interacted with the project's Technical Advisory Committee and the U.S. EPA Central Regional Laboratory in Annapolis, Maryland. He is also involved, as QA/QC manager and laboratory director, on the Folcroft Landfill/Tinicum Marsh EIS/RIFS. He directs and coordinates all sampling and analysis procedures with field staff and other (soils, wet chemistry) laboratories. Sampling includes surface water, bottom sediments, shallow soils, deep soils, and groundwater.

BDRDL002

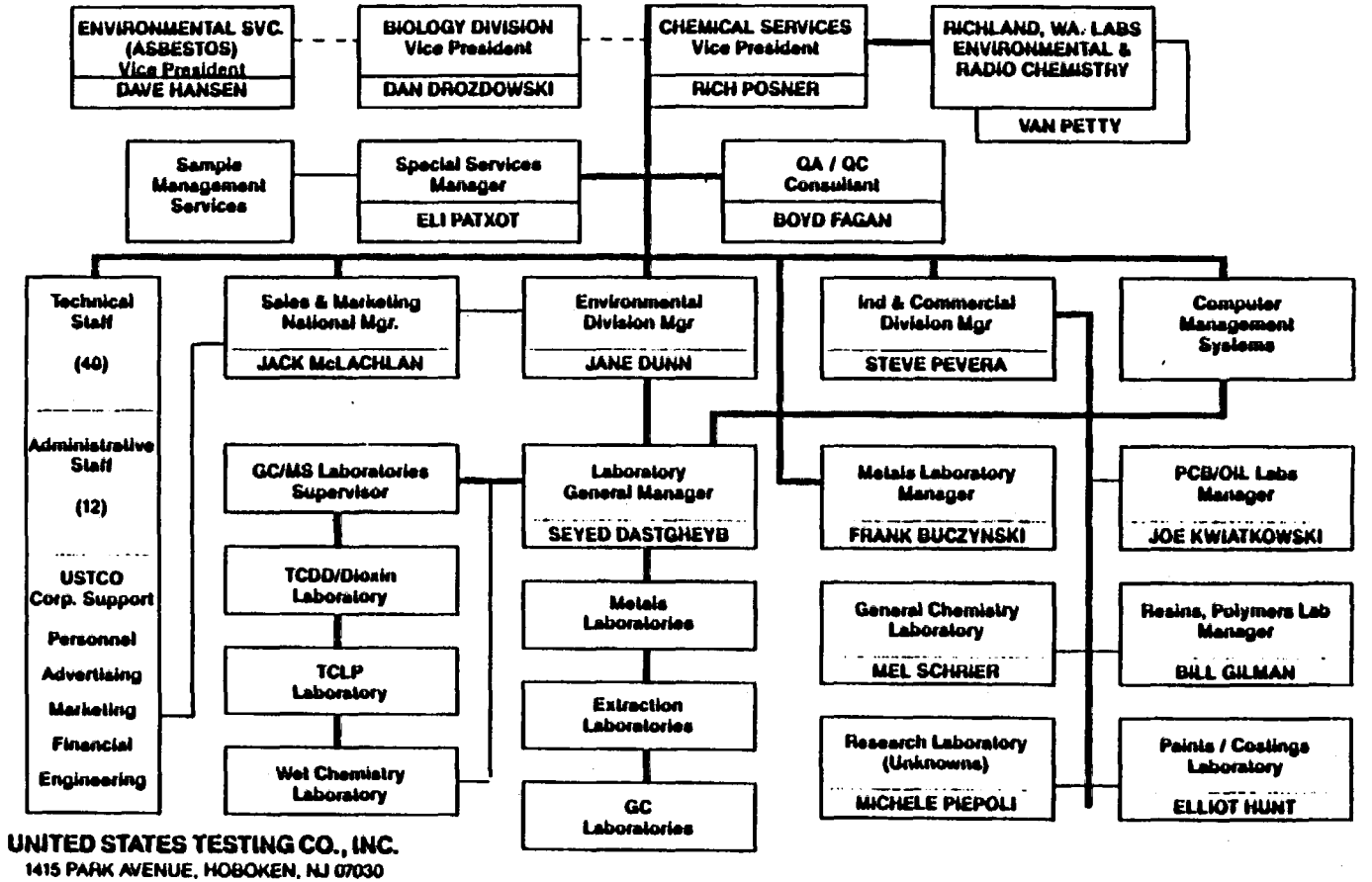
UNITED STATES TESTING COMPANY, INC.

Organizational Chart

Personnel Resumes

UNITED STATES TESTING COMPANY, INC.

(USTCO) CHEMICAL SERVICES ORGANIZATIONAL CHART



UNITED STATES TESTING CO., INC.
1415 PARK AVENUE, HOBOKEN, NJ 07030
201/792-2400 Telex: 7607729

January, 1988

US TESTING ORGANIZATIONAL CHART

UNITED STATES TESTING COMPANY, INC.

USTCO Personnel Requirements

1. *Pursuant to the regulations governing laboratory certification (NJAC 7:18-2.7 resumes of responsible personnel are enclosed. All personnel employed by USTCO meet these regulation.*

2. *Jane Dunn is the Quality Assurance Officer for the Chemical Services Division of USTCO. She has 3 years of experience in this position, and reports directly to the Divisional Vice President.*

3. *The following are the minimum requirements for USTCO personnel and equipment operation:*

   A. *The GC Operator shall have at least nine months experience in the operation of the GC on environmental samples. A formal training course in the operation of the GC may be substituted for three months experience.*

   B. *The GC/Mass Spectrometer (MS) Operator shall have completed a formal training course in the GC/MS and have at least six months experience in the operation of the GC/MS/Data System (DS) on environmental samples.*

   C *The Extraction/Concentration Specialist shall have at least one year experience in the preparation of extracts from environmental samples.*

   D. *The Purge and Trap Specialist shall have at least six months experience using the purge and trap technique for volatile organics.*

   E. *The Pesticide and Herbicide Residue Analysis Specialist shall have at least two years experience in organochlorine, organophosphorus pesticide, herbicide, and PCB analyses including method-specified cleanup procedures (such as column chromatography) on environmental samples.*

F. The Mass Spectral Hazardous Substance Interpretation Specialist shall have at least two years experience in the interpretation of mass spectra generated from GC/MS analysis of environmental samples.

G. The Supervisor of Pesticide Residue Analysis performing ECRA work shall have at least 2 years experience in organochlorine pesticides residue and PCB analysis, including cleanup procedures such as column chromatography, on environmental samples.

H. The Atomic Absorption Spectroscopist shall have at least 6 months experience in the operation of atomic absorption equipment or have completed a formal training course in the operation of atomic absorption equipment.

I. The Inductively Coupled Plasma operator shall have 9 months experience in the operation of ICP equipment or have completed a formal training course in the operations of ICP equipment.

Personnel Training

1. Currently (40%) of USTCO personnel are enrolled in universities for advanced degrees. Four (4) individuals are PhD candidates. All Laboratory Managers and Supervisors have B.S. or M.S. degrees in chemistry. Currently, 80% of the division's personnel have a science degree.

2. Concurrent Training:

It is the policy of USTCO to promote from within the Division, or from any of the 12 operating Divisions of the Corporation. Personnel review programs dictated by the Corporate Personnel Department are utilized in conjunction with specific individual training programs which are monitored by Corporate and Division management and supervised by specific laboratory managers. One phase of the compensation review awards points for educational advances. As another example, all employees are encouraged to attend professional trade shows and seminars at the company's expense.

UNITED STATES TESTING CO.
CHEMICAL SERVICES DIVISION
Management Resume Summaries

Division Vice President - Mr. Richard Posner is General Manager for the Division, reporting to the Corporation President. He has over 10 years of analytical experience, and is currently a PhD candidate majoring in Chemistry. Mr. Posner has 7 publications to his credit on Ion Chromatography and Graphite Furnace Atomic Absorpiton Spectorscopy. Mr. Posner has ACS certificaiton.

Division Manager - Ms. Jane Dunn is General Manager for the Chemical Services Division's Organic and Inorganic laboratories. She is also the principal Quality Assurance, Quality Control Officer, reporting to Mr. Posner. Ms. Dunn has 5 years of experience in analytical chemistry and as Document Control Officer. She is currently pursuing a B.S. degree, majoring in Chemistry.

Manager, Chemical Services Division - Mr. Steven C. Pevera, B.S. Chemistry, has had extensive analytical and management experience (29 years) with U.S.T.C.O., IBM, National Lead Company, and Martin Marietta. He has held various positions, such as Research Director, Production Manager, Marketing Manager, and as laboratory Supervisor for X-Ray Diffraction and Fluorescence analysis, Electron Microscopy, Gas Chromatography, Mass Spectroscopy, Atomic Absorption, Water Chemistry, General Chemistry, and Infra-Red laboratories. Mr. Pevera is responsible for the overall operation of the Division.

Organic Laboratory Manager - Mr. Seyed Dastgheyb is responsible for the overall supervision of the Environmental Analysis groups which include organics, extraction, isotope, TCDD (Dioxin), pesticide, and herbicide laboratories. Mr. Dastgheyb has 10 years of Chemical Analytical experience, and is a PhD candidate in Analytical Chemistry. Mr. Dastgheyb is currently doing research in Technique Development using AAGF, GC and IR for determination of toxic substances in fish liver.

GC/MS Laboratory Supervisor - Mr. Hossein Behzadi is responsible for the supervision of 3 GC/MS laboratories. He also has considerable experience in performing Atomic Absorption and ICP analysis of CLP methodologies for USEPA. Mr. Behzadi is currently a PhD candidate and doing research on the development of Polychlorinated Dibenzo Dioxins, and Dibenzo Furans.

Extraction Laboratory Supervisor - *Mr. Isudas Chauhan, holds a B.S. degree in Chemistry/Agriculture, and an M.S. in Animal Science. Mr. Chauhan has over 15 years analytical experience, and has 5 publications to his credit. Mr. Chauhan is currently responsible for the Extraction Laboratory (6 Chemists), and for all GC/GCMS extraction. He is also responsible for TCLP and Isotope Dilution Extraction procedures.*

Manager Non-Environmental Inorganics - *Mr. Frank Buczynski, B.S. Chemistry, has 11 years of inorganic analytical experience. He is responsible for the marketing and development of U.S.T.C.O.'s inorganic analytical services. Mr. Buczynski directed the start-up, installation, programming, QA/QC, and operator training for the U.S.T.C.O. ICP and AA systems.*

Assistant Vice President - *Mr. Joseph P. Kwiatkowski is responsible for client liason and management of the Chemical Serivces Division programs. Mr. Kwiatkowski also supervises the PCB/oil and bomb colorimeter laboratories. He has 24 years of chemical and analytical experience including chemical analysis of products for organic constituents, analysis of physical testing of petroleum products, paints, soaps, detergents, waxes, food products, paper, plastic and textiles, environmental corrosion testing, and analysis of combustion products.*

Group Leader, General Chemistry Laboratories - *Mr. Melvin H. Schrier, B.S. Chemistry, has 36 years of chemical and analytical experience with U.S.T.C.O. and Pittsburg Testing Laboratory. He is responsible for general organic chemical analysis, and for laboratory analysis of petroleum products, soaps, detergents, flammability tests, foods, waxes, and polishes. Mr. Schrier has published 2 articles on the determination of Nitro groups.*

Senior Analytical Chemist - *Mrs. Michele H. Peipoli, B.A. Chemistry, has 17 years of experience specializing in Infrared Spectroscopy, Gas Chromatography, UV-Visible and FT/IR Spectrophotometers, Liquid Chromatographs, and Purge and Trap systems. She also has extensive analytical experience with pesticides and PCB's and atmospheric sampling using Thermal Desorption and Gas Chromatography. Mrs. Piepoli currently is the Supervisor of the Research (unknown's) laboratories which determine composition of hazardous waste unknown's, and/or the components of various industrial and consumer products.*

Extraction Laboratory Specialist - Ms. Felicia Moon is responsible for extraction of acid/base neutrals and pesticides. She is also responsible for TCLP testing. Ms. Moon has a B.S. in Chemistry, and 5 years experience as an Extraction Chemist.

Inductively Coupled Plasma Operator - Ms. Betty Murphy has been performing Emission Spectroscopy analysis for 31 years. She has attended various university chemistry courses, ICP operations courses, and instrumentation laboratory courses. She has extensive operator experience with Semi-Quantitative Emission Spectroscopes, Atomic Emission Spectroscopes, X-Ray Diffraction/Fluorescence Spectrometers and both sequential and simultaneous ICP Spectroscopes.

Senior Chemist - Mr. Elliot B. Hunt, B.A. Chemistry, has 31 years of analytical experience with U.S.T.C.O., Celanese, Tenneco Chemical, and the National Bureau of Standards. He has extensive experience in the performance of environmental corrosion testing, evaluation of paints and coatings, textile adhesives, photochemicals, emulsion polymers, paint additives, defoamers, and dispersants, solvents, brake fluids, aerosols, acetate and acrylic emulsions, cosmetics, and air pollution control. Mr. Hunt has 4 publications related to properties and testing of paints and coatings.

Manager, Special Projects - Mr. William S. Gilman, M.S. Chemistry, MBA Chemical Marketing, has 24 years of Chemical and Analytical experience with U.S.T.C.O., Rehis Chemical, and Monsanto Research. He is responsible for special projects and consulting services in analytical, organic and specialty chemistry, foods, OTC drugs, pharmaceuticals, cosmetics, paints, coatings, polymers, and petroleum products. He is familiar with standard analytical methods, military and federal standards, trade standards, GMP and GLP. Mr. Gilman also has experience in establishing QA/QC protocols. He has also developed specialty chemicals for water treatment and oil well applications. Mr. Gilman has 10 publications to his credit.

Sample Management Services - Mr. Parsottam Borad, B.S. Microbiology and Chemistry, a Master Laboratory Technician Certificate, and is licensed by the NYC Department of Health as a Chemical Laboratory Technician. He has 6 years of analytical experience. Mr. Borad is currently responsible for the U.S.T.C.O. Customer Service Sample Management Program.

Maintenance Engineer Supervisor - Mr. Robert Rich, B.A. Education, and is a graduate of the Brick Computer Science Institute. Mr. Rich has 10 years experience with the Finnegan Corporation where he was responsible for technical support in the Northeast U.S. Mr. Rich is currently responsible for equipment maintenance of the Division.

Quality Assurance Consultant - *Mr. Boyd Fagan, B.S. Chemistry, 1949, is the Division's Staff Consultant responsible for Quality Program Development. He has over 35 years experience as Chemist, Spectroscopist, Laboratory Manager, and Quality Assurance Consultant. He develops and maintains QA systems and procedures specific to in-house projects and performs related consulting service programs offered to company clients.*

GC Laboratory Supervisor - *Ms. Mehry Kerdan, B.A. Chemistry, is pursuing a M.S. degree in Chemistry from the N.J. Institute of Technology. Ms. Kerdan has 4 years experience as an Extraction Chemist, and GC operator. She is currently responsible for analyzing samples for Pesticides/PCB's and herbicides and supervising the GC laboratory group.*

Consultant, Analytical Methods - *Mr. Mark Kasner, PhD Physical Chemistry, Perdue University, 1973. Dr. Kasner has 3 publications on Electro Analytical Chemistry, 1 patent on Conducting Polymers, and has received 2 grants for applications of computers in Chemistry.*

RMC ENVIRONMENTAL SERVICES

Personnel Resumes

William S. Ettinger
Senior Ecologist

Mr. Ettinger rejoined RMC in 1983 as a Senior Aquatic Ecologist. Previously, he had nine years of experience as a biologist with Ichthyological Associates, RMC, and Skelly and Loy, Engineers. His area of expertise is aquatic ecology, particularly with respect to macroinvertebrates and stream hydrology.

Mr. Ettinger's current responsibilities include the assessment of effects of industrial effluents, water diversion, and power plant operation on aquatic biota, particularly benthic macroinvertebrates. He has characterized macroinvertebrate communities in both freshwater and estuarine habitats in various locations throughout the United States. Particular projects include impacts of coal and metals mining, dredging operations, effects of electric generating station thermal effluents, and chemical spills. He is the author of several papers describing macroinvertebrate community investigations published in academic journals.

Mr. Ettinger received a B.S. in Fundamental Sciences from Lehigh University in 1972 and an M.S. in Entomology from the Pennsylvania State University in 1974. In addition, he has been trained in the use of U.S. Fish and Wildlife Service Habitat Evaluation Procedures (HEP), and the Instream Flow Incremental Methodology (IFIM). Mr. Ettinger is a member of the North American Benthological Society, the American Fisheries Society, and several other professional societies.

Charles E. Denoncourt
Aquatic Ecologist

Mr. Denoncourt, an aquatic ecologist, joined RMC in 1987. His experience includes 15 years of field experience collecting and sorting fishes and macroinvertebrates. His current responsibilities include collection and identification of fishes and macroinvertebrates, management of several water quality projects being performed for the U.S. Army Corps of Engineers, and short term aquatic environmental impact assessments.

While enrolled at the Pennsylvania State University as a Master's Candidate, he worked extensively with identification and evaluation of benthic macroinvertebrate communities in the upper Delaware River. His work included evaluating the feeding relationship between these invertebrates and abundant fish species.

While employed by Keystone Environmental Resources, Inc., of Pittsburgh, Mr. Denoncourt was responsible for organizing the Biological Section, including development of criteria for quality assurance in all aspects of field collection, sorting and identification of biological samples. He also designed, implemented and evaluated results from various impact assessments performed for industrial clients.

Mr. Denoncourt received a B.S. in Biology from York College of Pennsylvania in 1983. He will receive an M.S. in Fisheries and Wildlife Science from the Pennsylvania State University in 1988 upon completion of his thesis "Food Habits and Feeding Ecology of the American Eel in the Delaware River". He is the author of several papers and presentations.

George M. Christian
Aquatic Ecologist

Mr. Christian joined RMC in 1979 as a laboratory technician. Now a biologist, his area of expertise is aquatic ecology, including both fish and macroinvertebrates.

Mr. Christian's current responsibilities include collection and identification of macroinvertebrates in assessment of effects of power plant operations and other development projects. He has conducted distribution surveys and 316 (b) evaluations and participated in the preparation of impact assessments and technical basis reports for evaluations of acid mine drainage, stream relocation, and highway construction.

Mr. Christian received a B.S. in Biology from Kutztown University in 1987 and an A.A.S. in 1977 from Paul Smith's College of Arts and Sciences. He is a member of the North American Benthological Society.

SECTION B
REVISION NO. 0
DATE: April 1, 1988

ATTACHMENT B

United States Testing Company, Inc. Information

UNITED STATES TESTING COMPANY, INC. INFORMATION

Chain-of-Custody
Sample Chain of Custody Record
Sample Container Labeling Procedures
SOP Instrumental and Analytical Quality Control
Analytical Methodologies
Oil and Grease Analyses US EPA Methods 413.1 and 413.2
Blanks and Other QC Samples
SOP Document Control
Preventive Maintenance Program
Critical Spare Parts List

A-10

CHAIN-OF-CUSTODY

1.0 INTRODUCTION

Chain-of-Custody procedures provide documentation of the handling of each sample from the time it is collected until it is destroyed. Such a written record is especially important if the results of analyses of samples will be used to support litigation.

2.0 CHAIN-OF-CUSTODY PROTOCOLS

To maintain a record of (1) sample collection, (2) transfer of sample between personnel, (3) sample shipment, and (4) receipt by the laboratory which will analyze the sample (which will then continue the chain-of-custody within their laboratory records), a "Chain-of-Custody Record" is filled out for each sample type at each sampling location. Form F6260, or a reasonable facsimile, will be used on the REM II program. Each time the samples are transferred to another custodian, signatures of the person relinquishing the sample and receiving the sample, as well as the time and date, should document the transfer. As stated in Procedure 5622004 each sample container will be labeled with a pressure sensitive gummed label. The label contains the sample number, date and time of sample collection, location of sample collection, depth of sample collection, preservatives used and the names of collector(s) and initial(s).

The chain-of-custody form (F6260) will include four pressure sensitive copies so that four forms are filled out simultaneously. The On-site Coordinator retains the original and any extra copies, and additional copies are shipped with the samples until they are received by the laboratory(ies). If samples are split to different labs, a copy will go to each lab. Care must be taken that all four copies are legible. If additional duplicate sheets are required, the person relinquishing the samples is responsible for filling out additional copies, or making reproductions. The original must be returned by the On-site Coordinator to the site project files.

The Chain-of-Custody Record will be placed in a ziplock bag and placed inside of all shipping and transport containers. All samples will be shipped by Federal Express to the laboratory specified in the project operations plan. Samples should be packed so that no breakage will occur. The shipping or external container should be sealed with evidence tape and initialled so that any sign of tampering is easily visible.

United St . Testing Company, Inc.
Environmental Chemistry Division
1415 Park Avenue
Hoboken, New Jersey 07030
201/792-2400

SAMPL CHAIN OF CUSTODY RECORD

USTC Client: _____

Project Description:

ATTN:

Sampler (Signature)

NO. OF SAMPLE CONTAINERS

Page ___ of ___

STATION	DATE	TIME (Military)	SAMPLE DESCRIPTION	Volatile Organic Compounds	Acid Extractable Compounds	Base/Neutral Extractable Compounds	Pesticides	PCB's	Metals	Phenol	Cyanide	Petroleum Hydrocarbons	EP Toxicity - Organics	EP Toxicity - Inorganics	Reactivity	Ignitability	Corrosivity	(Qt. + ?)	REMARKS

ARB01003

Relinquished by (Signature):	Date	Time (Military)	Received by (Signature):	Date	Time (Military)	Relinquished by (Signature):	Date	Time (Military)	Received by (Signature)	Date	Time (Military)
Relinquished by (Signature):	Date	Time (Military)	Received by (Signature):	Date	Time (Military)	REMARKS:					

A-9

SAMPLE CONTAINER LABELING PROCEDURES

1.0 INTRODUCTION

The protocols for labeling of all samples collected at REM II sites are presented in this procedures.

2.0 SAMPLE CONTAINER LABELING

All samples must be identified with a self-adhesive Chain of Custody Label which shall be attached directly to the outside of the container. Sample labels must be completed with a waterproof pen. An example of the sample label is shown in Figure 1. The information recorded on the sample label includes the following:

- Sample Container Prepared by - Initials of laboratory personnel who cleaned and/or added preservatives and attached label.
- Sample Identification Codes - This is the code described in Procedure 5622002. The code will be placed on the label based on specifics presented in the Sampling Plan section of the Project Operations Plan.
- Site Name - Two or three word site identifier
- Date - A six digit number indicating the month, day and year of collection
- Time - A four digit number indicating the military time of collection.

FIGURE 1. EXAMPLE OF CHAIN-OF-CUSTODY SAMPLE LABEL

CHAIN-OF-CUSTODY SAMPLE LABEL

SAMPLE CONTAINER PREPARED BY _____

SAMPLE IDENTIFICATION CODE

SITE NAME _____

PRESERVATIVE _____

DATE _____ TIME _____

PARAMETER TO BE ANALYZED:

TEMP ('F) _____ _____ _____

SAMPLED BY _____ _____ _____

REFERENCE _____ _____ _____

SPECIAL INSTRUCTIONS/CAUTIONS: _____ _____

_____

LABORATORY NO. _____

- Temperature (°F) - The approximate temperature at which the sample was collected.

- Sample By - Initials of person(s) who collected the sample.

- Reference - The procedure number of the sampling protocol followed in collecting the sample.

- Special Instructions/Cautions - Are noted in this area. Split samples are labeled with identical information and "split" is noted in the special instructions/cautions box. Duplicates are given entirely separate identification numbers and are <u>not</u> identified on the sample label.

- Preservative - If a preservative is added to the sample container it is noted. If no preservative is added, enter "none".

- Parameter to be Analyzed - Specific parameters or general groups of parameters.

- Laboratory Number - Sample identification number used by the laboratory analyzing the sample.

As each sample is collected, a record is made in the field notebook and the sample is placed in a numbered container. The chests are brought to the decontamination area (Zone II) where, if necessary, the samples are separated for shipping to the analytical laboratories specified in the Project Operations Plan. Chain-of-Custody records (F6260) are filled out for all samples as described in the following section.

Sample label information is filled in to the extent possible prior to field sampling.

For samples requiring decontamination, the self adhesive chain-of-custody label must be completely covered with clear mylar tape prior to sampling.

Standard Operating Procedure
Instrumental and Analytical Quality Control

Calibration

All instruments are calibrated prior to analysis of any samples. The sections that follow describe calibration procedures used for each instrument.

GC/MS

Initially, the instruments are to be tuned to EPA specifications for spectral abundances for Bromofluorobenzene (Volatiles) or Decafluorotriphenylphosphine (ABN's). Tables I and II present tuning criteria.

Table I BFB Tuning Criteria

Mass	Ion Abundance Criteria
50	15.0%-40.0% of the base peak
75	30.0%-60.0% of the base peak
95	base peak, 100% Relative Abundance
96	5.0%-9.0% of the base peak
173	less than 1.00% of the base peak
174	greater than 50.0% of the base peak
175	5.0%-9.0% of mass 174
176	greater than 95% but less than 101.0% of mass 174
177	5.0%-9.0% of mass 176

Table II DFTPP Tuning Criteria

Mass	Ion Abundance Criteria
51	30.0%-60.0% of mass 198
68	less than 2.0% of mass 69
70	less than 2.0% of mass 69
127	40.0%-60.0% of mass 198
197	less than 1.0% of mass 198
198	base peak, 100% Relative Abundance
199	5.0%-9.0% of mass 198
275	10.0%-30.0% of mass 198
365	greater than 1.00% of mass 198
441	present but less than mass 443
442	greater than 40.0% of mass 198
443	17.0%-23.0% of mass 442

Once tuned, the instruments are calibrated by analyzing five concentrations of all contaminants of interest, spaning a range of 10-200 ug/l. Response factors for each contaminant, relative to an internal standard, are calculated. Response factors for System Performance Check Compounds (SPCC) must be greater than 0.300 for Volatile Organics (except Bromoform, which must be greater than 0.250) and greater than 0.050 for Semivolatiles. Table III lists the SPCC compounds.

Table III SPCC Compounds

Volatiles	Semivolatiles
Chloromethane	N-Nitroso-Di-n-Propylamine
1,1-Dichloroethane	Hexachlorocyclopentadiene
Bromoform	2,4-Dinitrophenol
1,1,2,2-Tetrachloroethane	4-Nitrophenol
Chlorobenzene	

In addition, Calibration Check Compounds (CCC) must be evaluated in the initial calibration standards. The percent relative standard deviation (RSD) bust be less than 30% over the calibration range for each CCC. Table IV lists the CCCs.

Table IV CCC Compounds

Volatiles	Semivolatiles
Vinyl Chloride	1,4-Dichlorobenzene
1,1-Dichloroethene	2-Nitrophenol
Chloroform	Hexachlorobutadiene
1,2-Dichloropropane	4-Chloro-3-Methylphenol
Toluene	2,4,6-Trichlorophenol
Ethylbenzene	Acenaphthene
	N-Nitrosodiphenylamine
	Pentachlorophenol
	Fluoranthene
	Di-n-octyl Phthalate
	Benzo(a)Pyrene

Once initial calibration is completed, tuning and calibration must be verified every 12 hours. Tuning is verified by analysis of BFB or DFTPP and evaluation against the criteria in Tables I and II. Calibration is verified by analysis of a 50 ppb volatile standard or a 50 ppm semivolatile standard, and evaluation of CCC and SPCC criteria. For continuing calibration checks, the maximum permissable % difference between the average response factor from the initial calibration and the response factor from the verification standard is 25% for all CCCs. SPCC criteria are the same for initial and continuing calibration standards.

GC

Pesticides are analyzed by the external standard method. At the beginning of each 72 hour period, Evaluation Standards A, B, and C are analyzed. These contain Aldrin at 2, 10 and 20 ng/ml respectively, and Endrin, 4,4'-DDT and Dibutylchlorendate (surrogate) each at 10, 50 and 100 ng/ml respectively. Linearity of response is determined from these standards by calculating the calibration factor for each (peak area/mass injected). The % RSD of the calibration factors for each compound must be no greater than 10%. In addition, the % breakdown for 4,4'-DDT and Endrin in Evaluation Standard B must not exceed 20%.

Once linearity and the absence of breakdown have been documented, standards of all pesticides of interest must be analyzed. Single response pesticides are mixed in two Standards: Individual Standard Mix A and Individual Standard Mix B. In addition, each multi-response pesticide is run individually. Once each of these are analyzed, five samples can be analyzed, followed by analysis of another standard. The analytical sequence for pesticides should be as given in Table V.

Table V. 72 Hour Pesticide Analysis Sequqnce

1. Evaluation Standard Mix A
2. Evaluation Standard Mix B
3. Evaluation Standard Mix C
4. Individual Standard Mix A

5. Individual Standard Mix B
6. Toxaphene
7. Chlordane
8. Aroclor 1016+Aroclor 1260

9. Aroclor 1221
10. Aroclor 1232
11. Aroclor 1242
12. Aroclor 1248

13. Aroclor 1254
14. 5 Samples
15. Evaluation Standard Mix B
16. 5 Samples

17. Individual Standard Mix A or B
18. 5 Samples
19. Repeat from step 15
20. Analysis must end with Individual Standard Mix A or B

The retention time shift of Dibutylchlorendate must be no greater than 2% between the initial standard analysis and any sample analyzed during the 72 hour period.

Atomic Absorption

1. Each instrument is to be calibrated daily. Calibration standards are prepared from the stock standards and are recorded in the standards log.

2. After the instrument is calibrated, the initial calibration is verified and documented using an EPA Quality Control Solution. The control limits for this analysis are as follows:

Mercury and Tin	80% - 120%
All other Metals & Cyanide	90% - 110%

If the results do not comply, the instrument is recalibrated and calibration is reverified.

ICP

Plasma calibration is a two point standardization using the reagent blank as the low standard. The high standard should be at least 1000x detection limits, and at or below linearity limit.

The upper linearity ranges for the ICP 9000 are as follows:

Al	500,000	ug/l	Mn	100,000	ug/l
Sb	1,000	ug/l	Ni	5,000	ug/l
Ba	5,000	ug/l	K	200,000	ug/l
Be	1,000	ug/l	Ag	1,000	ug/l
Cd	5,000	ug/l	Na	200,000	ug/l
Ca	200,000	ug/l	V	5,000	ug/l
Cr	5,000	ug/l	Zn	100,000	ug/l
Co	5,000	ug/l			
Cu	100,000	ug/l			
Fe	500,000	ug/l			
Pb	5,000	ug/l			
Mg	200,000	ug/l			

Furnace Calibration

For furnace AA analysis, the instrument is calibrated for each element at the time of analysis. The Varian 1475/GTA95 calibrates automatically, using the highest standard and diluting it. Furnace calibration is a four point calibration using the blank as its lowest standard.

The calibration ranges for each element are as follows:

As	0 - 100 ug/l
Pb	0 - 100 ug/l
Se	0 - 100 ug/l
Tl	0 - 100 ug/l
Sn	0 - 300 ug/l

The calibrating standards are chosen within these ranges and programmed into the instrument. The instrument will then perform the necessary dilutions on the high standard.

A typical table for sample parameters follows:

Without Chemical Modifier:

Sampler Parameters			Normal Calibration	
Samples and Standards				
Type	Location	Volume	Blank Volume	Modifier Volume
Blank	--		30	
STD 1	51	6	24	
STD 2	51	12	18	
STD 3	51	18	12	
STD 4	51	24	6	
STD 5	51	30		
Samples	--	30		

With Chemical Modifier:

Sampler Parameters Samples and Standards			Normal Calibration	
Type	Location	Volume	Blank Volume	Modifier Volume
Blank	--		30	10
STD 1	46	30	30	10
STD 2	47	30	30	10
STD 3	48	30	30	10
STD 4				
STD 5				
Samples	--	30	30	10

Location refers to vial location on the autosampler carousel. Volume refers to high standard volume.

Continuing Calibration Verification & Calibration Blank

A continuing calibration verification and a calibration blank will be run after each ten analyses and after the last analytical sample. The same continuing calibration standard must be used throughout the analysis for a case of samples.

The control limits are as follows:

Tin and Mercury	80% - 120%
All other Metals & CN	90% - 110%

Blank results must be below the CRDL for each element.

If there is any deviation in the above, the instrument must be recalibrated and the preceeding 10 samples reanalyzed.

ANALYTICAL METHODOLOGIES

The methods and QC criteria employed by the Division are those approved and accepted by the USEPA and NJDEP. These methods are incorporated into the following references:

Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, 7/85 Revision, USEPA Washington, D.C.

Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, 7/84 Revision, USEPA, Washington, D.C.

Statement of Work for Dioxin Analysis, Soil/Sediment Matrix, Multi-Concentration, Selected Ion Monitoring GC/MS Analysis with Jar Extraction Procedure, USEPA, Washington, D.C.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 2nd Edition April 1984 Revision, USEPA, Office of Solid Waste and Emergency Response, Washington, D.C.

Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, March 1979, USEPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH

The Determination of Polychlorinated Biphenyls in Transformer Fluid and Waste Oils, EPA 600/4-81-045, April 1981, USEPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH

Federal Register, Vol. 49, No. 209, 43234-43442, Friday, October 26, 1984

Federal Register, Vol. 50, No. 3, 690-697, Friday, January 4, 1985

Standard Methods for the Examination of Water and Wastewater, 15th and 16th Editions, American Public Health Associations, Washington, D.C.

Annual Book of Standards, Part 31, Water, American Society for Testing and Material, Philadelphia, PA

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

WATER POLLUTION QUALITY CONTROL SAMPLES

Instructions for OIL AND GREASE Analyses
USEPA Methods 413.1 and 413.2

CAUTION: Read Instructions Carefully Before Opening Ampuls.

One sample concentrate containing oil and grease is enclosed. The concentrate consists of paraffin oil and is diluted with spectro-grade trichlorotrifluoroethane. The concentration and stability of the concentrate has been thoroughly checked and verified by analyses over a period of months. The concentrate is to be spiked into laboratory-pure water and analyzed for oil and grease at milligram per liter levels in the water, using the gravimetric, or spectro- photometric infrared (IR) methods of analyses. The final choice of a method is left to the individual, however, the sample must be diluted and extracted as described in the following section.

Sample Preparation

To begin the analyses, snap off the top at the break area on the neck of the ampul. For gravimetric analysis, pipet exactly 5.0 mL of the concentrate into a two liter separatory funnel containing 995 mL of laboratory-pure water and 5 mL of 1:1 HCl in water. For IR analyses, pipet exactly 2.0 mL of the concentrate into a two liter separatory funnel containing 995 mL of laboratory-pure water and 5 mL of 1:1 HCl in water.

Proceed with the extraction step as described in the EPA manual, "Methods for Chemical Analysis of Water and Wastes," Section 413.1 (Gravimetric) and 413.2 (Infrared). A laboratory blank should be prepared and analyzed for background correction for each of the two oil methods.

A sheet containing a statement of true values is enclosed for use as you desire. If there are any technical questions or problems please contact:

Quality Assurance Branch
EMSL-Cincinnati
U.S. Environmental Protection Agency
Cincinnati, OH 45268

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

WATER POLLUTION QUALITY CONTROL SAMPLES

TRUE VALUES*

Oil and Grease, mg/L

When diluted to volume according to instructions, the sample (1 liter of water) has the following concentrations:

Gravimetric Method (mg/L)

Concentrate	True Value*	95% Confidence Interval**
3	34.0	27.0 - 37.6

IR Spectrophotometric Method (mg/L)

The IR method produces results which are not identical to those of the gravimetric method because the composition of the QC sample varies from that of the IR standard. The IR method is based on the absorbance characteristics of C-H bonding. Hence, identical results between IR and gravimetric methods will only occur when the sample and standard have the same chemical composition.

Concentrate	True Value*	95% Confidence Interval**
3	13.6	18.8 - 26.5

*True value represents the actual weighings of the paraffin oil for the stock solutions and all subsequent dilutions to give the final concentration of the sample. The $\bar{X}$ (mean recovery), S (standard deviation) and 95% confidence interval were developed from Performance Evaluation Studies regression equations.

OIL AND GREASE, TOTAL, RECOVERABLE

Method 413.1 (Gravimetric, Separatory Funnel Extraction)

STORET NO. 00556

1. Scope and Application
   - 1.1 This method includes the measurement of fluorocarbon-113 extractable matter from surface and saline waters, industrial and domestic wastes. It is applicable to the determination of relatively non-volatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases and related matter.
   - 1.2 The method is not applicable to measurement of light hydrocarbons that volatilize at temperatures below 70°C. Petroleum fuels from gasoline through #2 fuel oils are completely or partially lost in the solvent removal operation.
   - 1.3 Some crude oils and heavy fuel oils contain a significant percentage of residue-type materials that are not soluble in fluorocarbon-113. Accordingly, recoveries of these materials will be low.
   - 1.4 The method covers the range from 5 to 1000 mg/l of extractable material.
2. Summary of Method
   - 2.1 The sample is acidified to a low pH (< 2) and serially extracted with fluorocarbon-113 in a separatory funnel. The solvent is evaporated from the extract and the residue weighed.
3. Definitions
   - 3.1 The definition of oil and grease is based on the procedure used. The nature of the oil and/or grease, and the presence of extractable non-oily matter will influence the material measured and interpretation of results.
4. Sampling and Storage
   - 4.1 A representative sample of 1 liter volume should be collected in a glass bottle. If analysis is to be delayed for more than a few hours, the sample is preserved by the addition of 5 ml HCl (6.1) at the time of collection and refrigerated at 4°C.
   - 4.2 Because losses of grease will occur on sampling equipment, the collection of a composite sample is impractical. Individual portions collected at prescribed time intervals must be analyzed separately to obtain the average concentration over an extended period.
5. Apparatus
   - 5.1 Separatory funnel, 2000 ml, with Teflon stopcock.
   - 5.2 Vacuum pump, or other source of vacuum.
   - 5.3 Flask, boiling, 125 ml (Corning No. 4100 or equivalent).
   - 5.4 Distilling head, Claisen or equivalent.
   - 5.5 Filter paper, Whatman No. 40, 11 cm.
6. Reagents
   - 6.1 Hydrochloric acid, 1:1. Mix equal volumes of conc. HCl and distilled water.

Approved for NPDES
Issued 1974
Editorial revision 1978

6.2 Flurocarbon-113,(1,1,2-trichloro-1,2,2-trifluoroethane), b. p. 48°C.

6.3 Sodium sulfate, anhydrous crystal.

7. Procedure

7.1 Mark the sample bottle at the water meniscus for later determination of sample volume. If the sample was not acidified at time of collection, add 5 ml hydrochloric acid (6.1) to the sample bottle. After mixing the sample, check the pH by touching pH-sensitive paper to the cap to insure that the pH is 2 or lower. Add more acid if necessary.

7.2 Pour the sample into a separatory funnel.

7.3 Tare a boiling flask (pre-dried in an oven at 103°C and stored in a desiccator).

7.4 Add 30 ml fluorocarbon-113 (6.2) to the sample bottle and rotate the bottle to rinse the sides. Transfer the solvent into the separatory funnel. Extract by shaking vigorously for 2 minutes. Allow the layers to separate, and filter the solvent layer into the flask through a funnel containing solvent moistened filter paper.

NOTE: An emulsion that fails to dissipate can be broken by pouring about 1 g sodium sulfate (6.3) into the filter paper cone and slowly draining the emulsion through the salt. Additional 1 g portions can be added to the cone as required.

7.5 Repeat (7.4) twice more, with additional portions of fresh solvent, combining all solvent in the boiling flask.

7.6 Rinse the tip of the separatory funnel, the filter paper, and then the funnel with a total of 10–20 ml solvent and collect the rinsings in the flask.

7.7 Connect the boiling flask to the distilling head and evaporate the solvent by immersing the lower half of the flask in water at 70°C. Collect the solvent for reuse. A solvent blank should accompany each set of samples.

7.8 When the temperature in the distilling head reaches 50°C or the flask appears dry remove the distilling head. Sweep out the flask for 15 seconds with air to remove solvent vapor by inserting a glass tube connected to a vacuum source. Immediately remove the flask from the heat source and wipe the outside to remove excess moisture and fingerprints.

7.9 Cool the boiling flask in a desiccator for 30 minutes and weigh.

8. Calculation

8.1 mg/l total oil and grease = $\frac{R - B}{V}$

where:

R = residue, gross weight of extraction flask minus the tare weight, in milligrams.

B = blank determination, residue of equivalent volume of extraction solvent, in milligrams.

V = volume of sample, determined by refilling sample bottle to calibration line and correcting for acid addition if necessary, in liters.

9. Precision and Accuracy

9.1 The two oil and grease methods in this manual were tested by a single laboratory (EMSL) on sewage. This method determined the oil and grease level in the sewage to be 12.6 mg/1. When 1 liter portions of the sewage were dosed with 14.0 mg of a mixture of #2 fuel oil and Wesson oil, the recovery was 93% with a standard deviation of ±0.9 mg/1.

Bibliography

1. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 515, Method 502A. (1975).
2. Blum, K. A., and Taras, M. J., "Determination of Emulsifying Oil in Industrial Wastewater", JWPCF Research Suppl. 40, R404 (1968).

Blanks and Other QC Samples

Organics

A reagent blank is to be analyzed at a minimum of once per 20 samples of a similar matrix per case for Volatile Organics, or once every twelve hours, immediately following the standard, whichever is more frequent. All volatile compounds must be below the CRDL, with the exception of the following common lab solvents, which must be below 5 x CRDL:

Methylene Chloride
Acetone
Toluene

One reagent blank per 20 samples of a similar matrix is to be extracted for semivolatiles and pesticides. All compounds must be below the CRDL.

Inorganics

1. At least one prep blank, consisting of the method required reagents processed through each sample prparation procedure for each case, must be prepared and analyzed for every 20 samples received of a single matrix. The concentration of the prep blank must be less than the CRDL. If it is not, the samples associated with that blank are to be redigested and reanalyzed.

2. Aqueous and solid laboratory control samples must be analyzed for each analyte using the same sample preparation and analytical methods used for EPA samples.

   One aqueous LCS must be analyzed for every 20 samples received. Once a month a solid LCS will be analyzed and reported.

   The control limits are as follows:

   80% - 120% all analytes

   If the results are not satisfactory, the problem should be corrected and the samples associated reanalyzed.

3. To verify inter-element and background correction factors, an interference check sample is analyzed at the beginning and end of each sample analysis run (or a minimum of twice per 8 hour working shift). This solution is obtained from the EPA. Results must fall within ± 20% of the true value.

STANDARD OPERATING PROCEDURE FOR DOCUMENT CONTROL

To ensure that all documents relating to each EPA case are compiled in one secure location, the following procedure is to be implemented:

I Case File Folders

A) At the time of sample receipt the Sample Custodian will set up a file folder for each submitted case. Each folder will be clearly labeled with the USTC project number and the SMO case number.

B) All documents, sample tags, SMO forms and laboratory generated data for each case will be placed in the individual file folder established for that case.

C) Documents such as sample tags, traffic reports, airbills, notebook pages, etc. will be arranged by document type. The actual data package original will also be contained in the file.

D) All current case files are kept in the office of the Sample Custodian. Once the deliverables have been distributed, the files may be moved to a secure storage area outside of the Sample Custodian's Office.

II Document Numbering & Inventory

A) All documents in each case file will be assigned a serialized number (document control #) associating it with the case and region, e.g., SMO case # 2560 - Region III - Serialized document # 01.

B) The serialized numbers will be assigned by document type, and the document control # is recorded on each document or set of documents.

C) A document inventory sheet is included in each case file. The assigned document control number and number of pages of each is listed next to the document or section description. Examples of document inventory sheets for organics and inorganics cases are attached.

File Inventory (Organics)

Job # _____ Case # _____

Document Control #	Document	# Pages
_____	Chain of Custody Record (s)	_____
_____	Sample Tag (s)	_____
_____	Airbill #	_____
_____	USTC Receiving Report (s)	_____
_____	Organics Chronicle (s) (Extraction)	_____
_____	Organics Chronicle (s) (Analysis)	_____
_____	Sample Receipt Log Sheet (copy)	_____
_____	Internal Custody Record (copy)	_____
_____	Related Correspondence	_____
_____	QC Summary Packet	_____
_____	Sample Data Packet	_____
_____	Standards Packet	_____
_____	Raw QC Data Packet	_____
_____	Sample Preparation Packet	_____

* If any of the above documents are not present an explanation for their absence must be included.

Preventive Maintenance Program
Duties/Inventories

Level I Operator Duties:
a. Calibration check every 12 hours of use
b. Column performance check for every 12 hours
c. Septa, column and liner changes when needed
d. Instrument tuning and calibration when necessary

Level II Maintenance Engineer Duties
a. Quarterly
1. Check and replace pump oils if needed
2. Check all power supplies in insturment
3. Change disk drive filters
4. Check and clean disk drive heads

b. Biannual
1. Check and replace turbo oil if needed

c. Emergency
1. Repair or replace any damaged circuits or parts as needed
2. Perform head alignments

Level III Annual Service Agreement Contracts with Manufacturers
a. See service agreements

Note

Industry average downtime on GC, GC/MS is 20%.
The Testing Company averages 12-14%

Preventive Maintenance

GC/MS

Internal Standard area responses are to be monitored in all samples. Significant decreases in these responses indicate the need to clean or replace the ion source. Regardless of responses, the source is to be cleaned at a minimum of bi-weekly, and more frequently should the need arise. The maintenance engineer is responsible for cleaning and installation of cleaned sources.

Additional, routine maintenance is to be performed weekly. This includes cleaning and/or changing the injection port liner, changing the injection port septum, and removing the top few inches of the capillary column.

Non-routine maintenance is performed by the maintenance engineer as required. To permit the maintenance engineer to identify the need for ruotine and non-routine maintenance, a Trouble Log Sheet is to be completed daily by each operator, at the end of his/her shift. An example of a Trouble Log is presented in Figure 2.3.

All routine and non-routine maintenance should be documented in a log. This can be achieved by entering the maintenance in the instrument run log, or by keeping a separate maintenance log for each instrument. The choice of which method to use is left to the operator. Once the choice is made, however, the same method must always be used.

TROUBLE LOC

Instrument: _____

Operator: _____

Date: _____

Time: _____

☐ Instrument O.K. ☐ Tune O.K.

☐ Calibration O.K. ☐ No problems

List any problems:

_____

_____

_____

_____

_____

_____

Comments:

_____

_____

_____

_____

_____

_____

Figure 2.3

AA Maintenance

Graphite furnace tubes should be checked periodically for degradation, and changed as necessary. Inconsistent standard responses may indicate the need to change the furnace tube.

Any operating problems should be brought to the attention of the laboratory supervisor, who will attend to the problem perosnally or contact the appropriate service group.

GC Maintenance

Area responses are to be monitored for standards, and decreasing responses are considered an indication of the need to clean the detector. Loss of resolution in standads is used to indicate the need to clean or re-pack packed columns, or to remove the top few inches of capillary columns.

Routine maintenance is to be performed weekly, and includes changing injection port septa, cleaning or changing injection port liners, etc.

Non-routine maintenance is performed as required by the maintenance engineer. Request for non-routine maintenance is made verbally by the GC operator.

All routine and non-routine maintenance should be documented in a log. This can be achieved by entering the maintenance in the instrument run log, or by keeping a separate maintenance log for each instrument. The choice of which method to use is left to the operator. Once the choice is made, however, the same method must always be used.

ICP Maintenance

The plasma torch from the ICP is cleaned of solids build-up periodically, at a minimum of once per week, and more often if the need is indicated. The filter in the cooling water line is to be checked weekly, and changed as needed.

Any operating problems should be brought to the attention of the laboratory supervisor, who will attend to the problem perosnally or contact the appropriate service group.

Parts Inventory ($100,000) Average Stockpile

A. GC/MS
   1. One of each major circuit boards
   2. All parts for source repairs
   3. Disk drive heads
   4. Maintain service contract on all CDC drives

B. GC, AA, ICAP
   1. Spare lamp for each element and minor replacement parts for each instrument
   2. All major service performed by manufacturer service representatives